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Masuda

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(54) **VALVE MECHANISM FOR TUBE-TYPE FLUID CONTAINER**

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(30) **Foreign Application Priority Data**

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Jul. 8, 2002 (JP) 2002-198089

(51) **Int. Cl.**
B65D 25/40 (2006.01)

(52) **U.S. Cl.** **222/494**; 222/212

(58) **Field of Classification Search** 222/494–497, 222/386.5, 209, 212, 286.5
See application file for complete search history.

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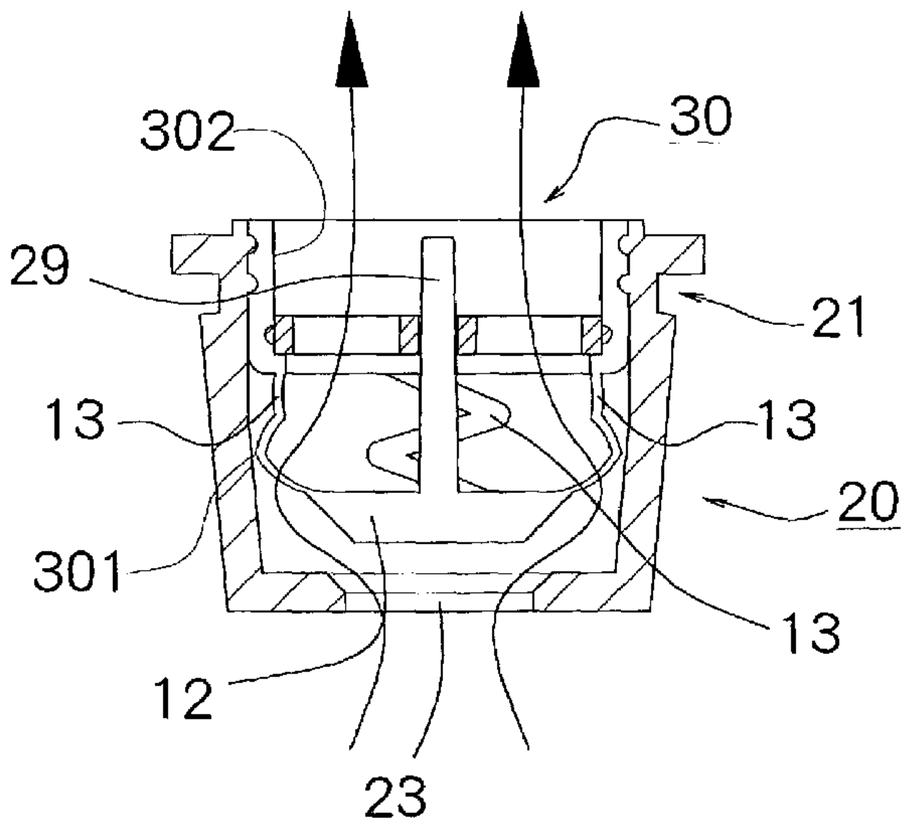
(57) **ABSTRACT**

A valve seat portion **20** has a nearly tubular shape, at the bottom of which a circular opening portion **23** which functions as a valve seat is formed. A valve portion **10** has a ring-shaped supporting portion **11** which is disposed inside the valve seat portion **20**. A valve body **12** has a shape corresponding to the circular opening portion **23**, and multiple coupling portions couple the supporting portion **11** and the valve body **12**. In the valve portion **10**, the valve body can move between a closed position in which the valve body closes the opening portion **23** in the valve seat portion **20** and an open position in which the valve body opens the opening portion **23** by the flexibility of the four coupling portions **13**.

27 Claims, 32 Drawing Sheets



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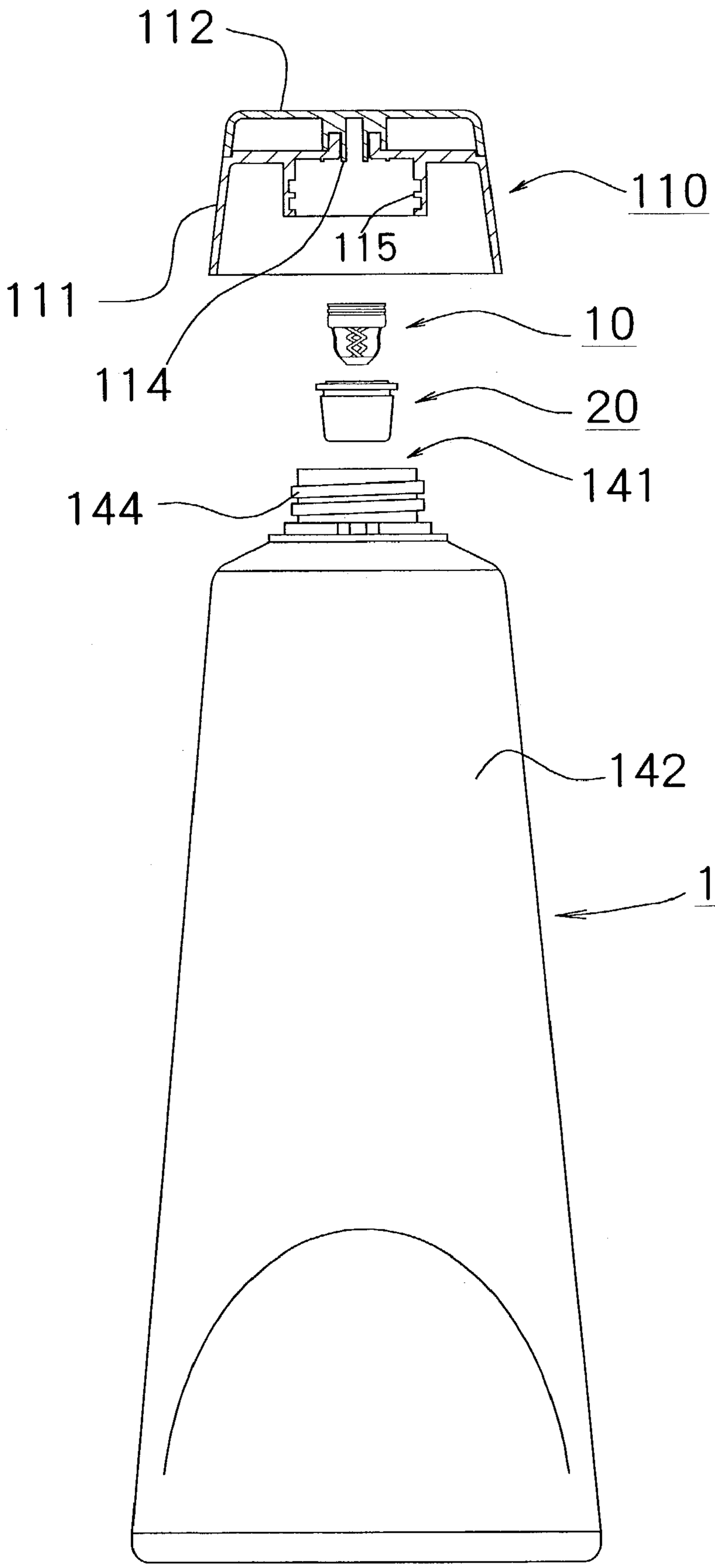

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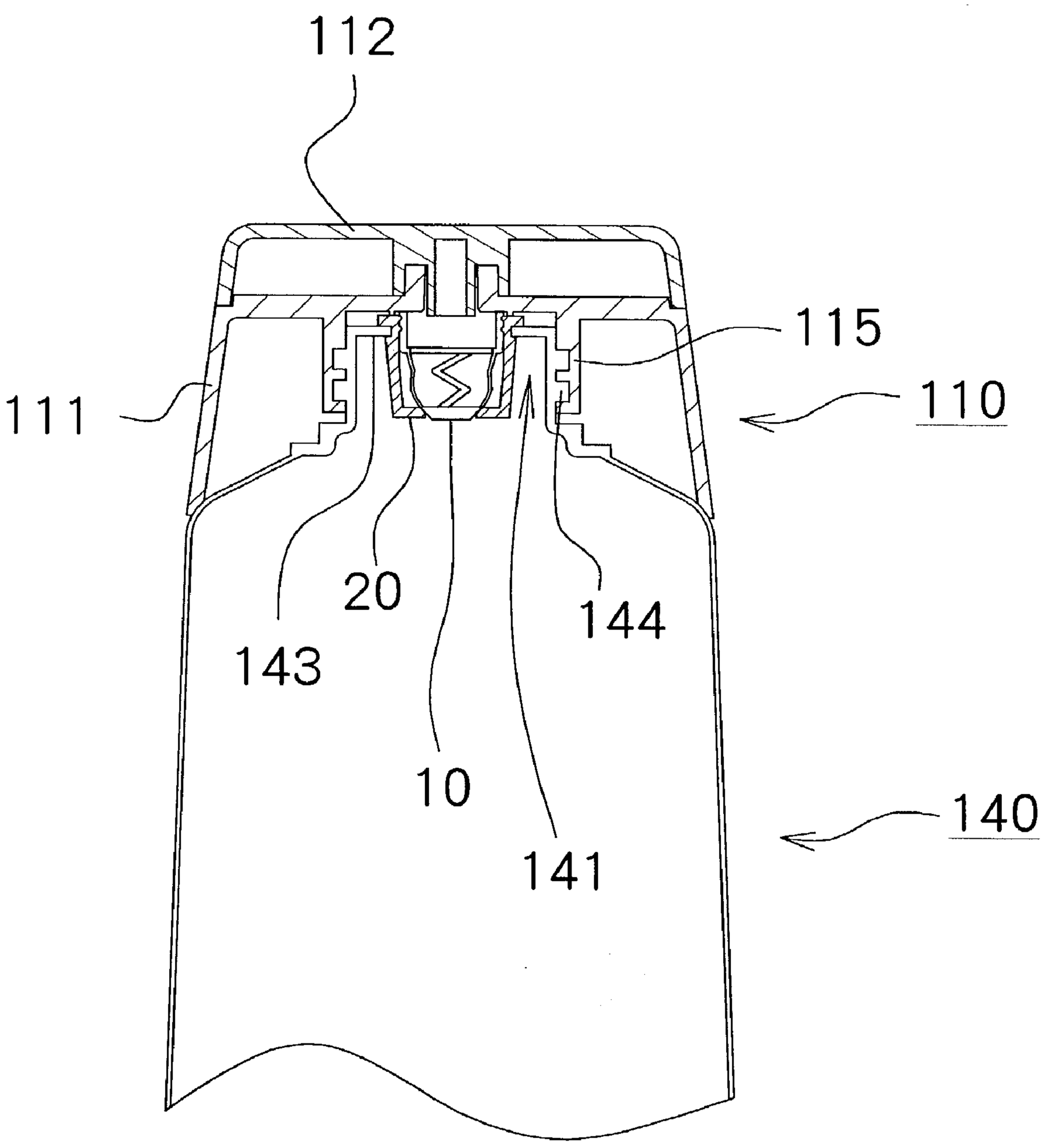

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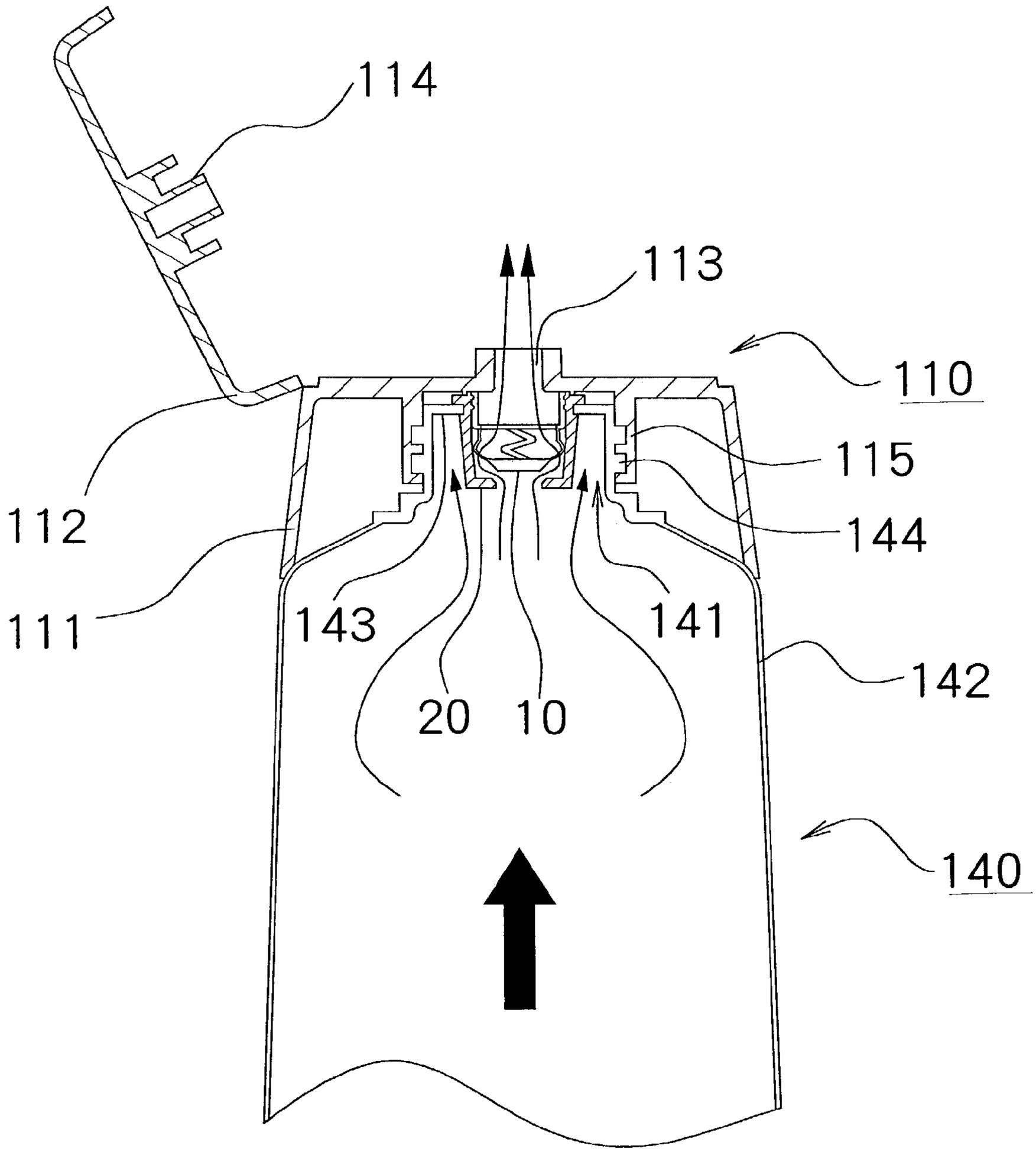

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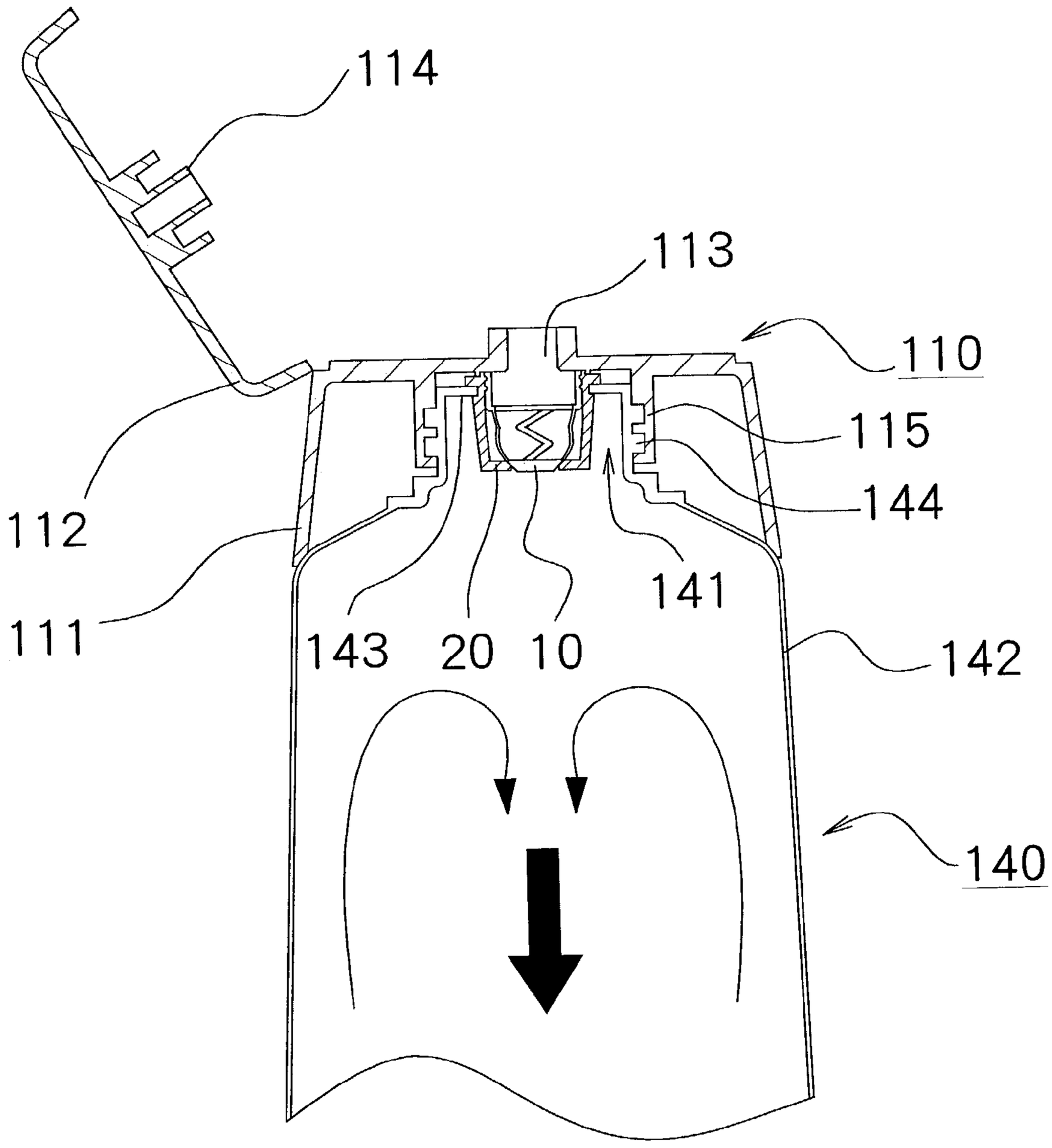
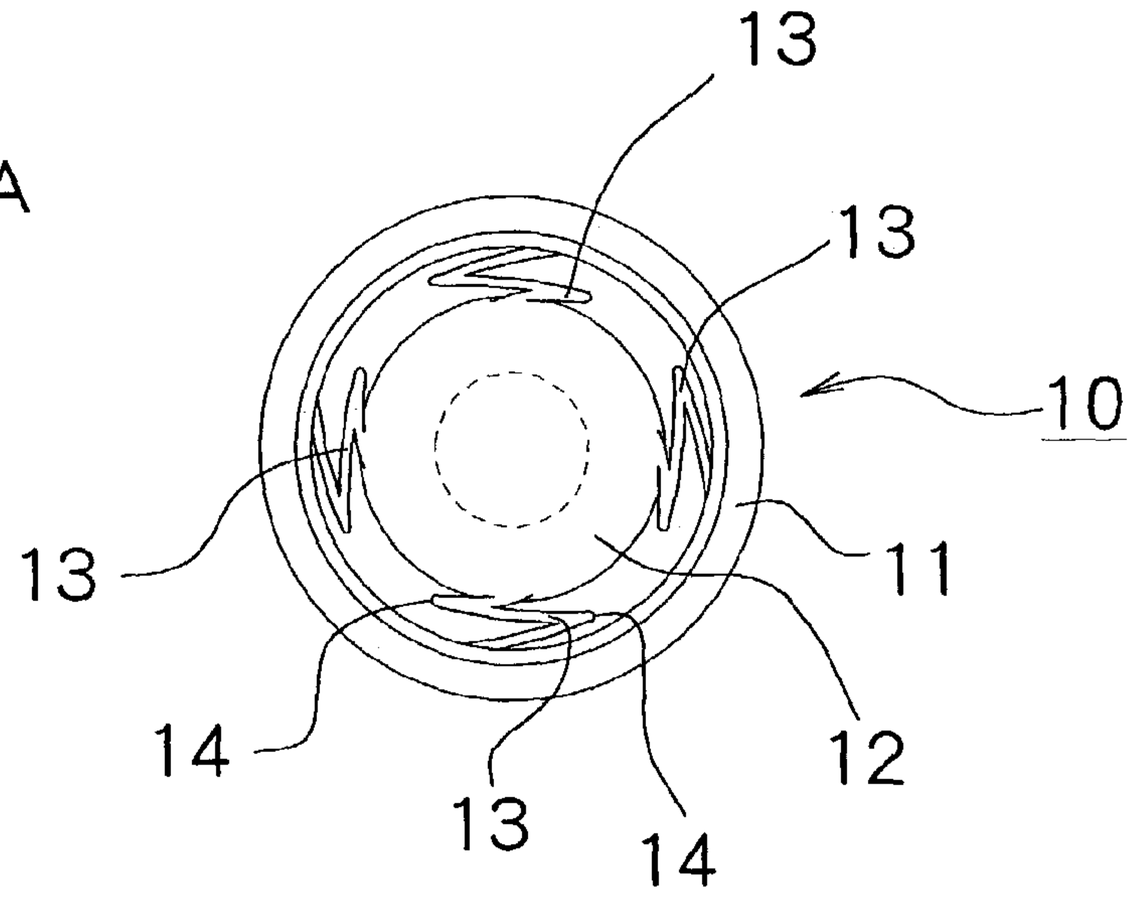


Fig.4

Fig.5A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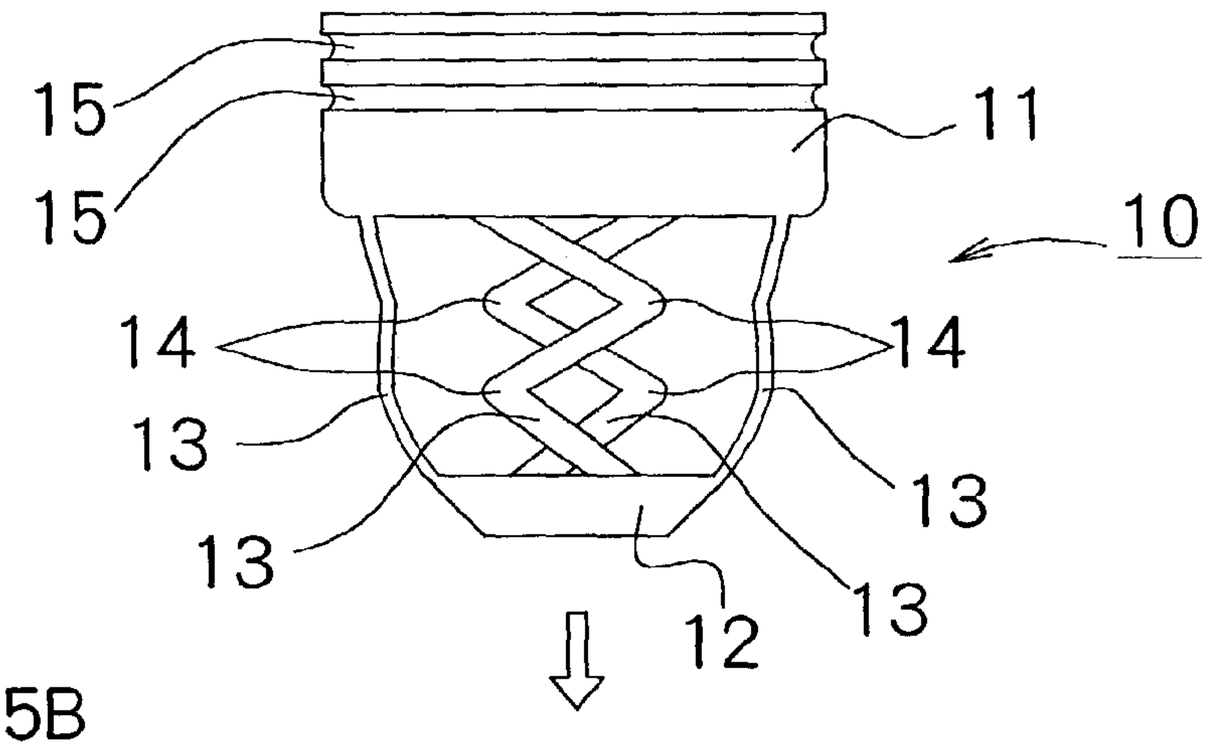
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Fig.5B

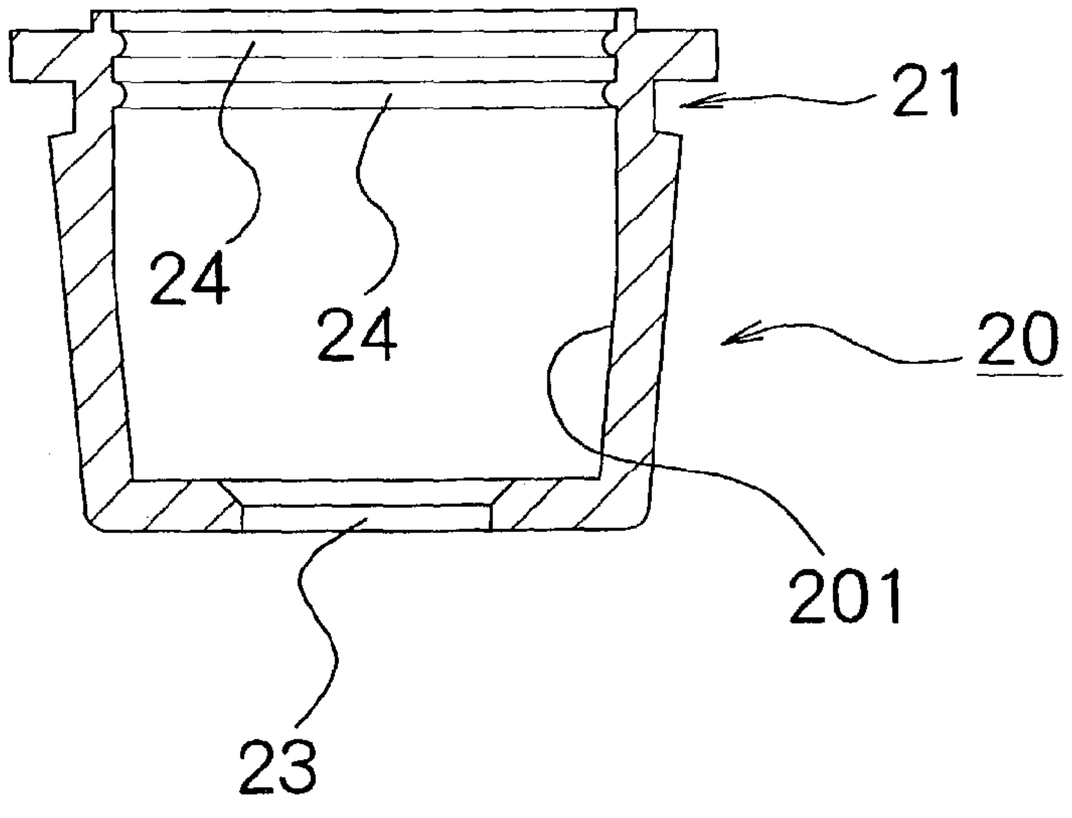
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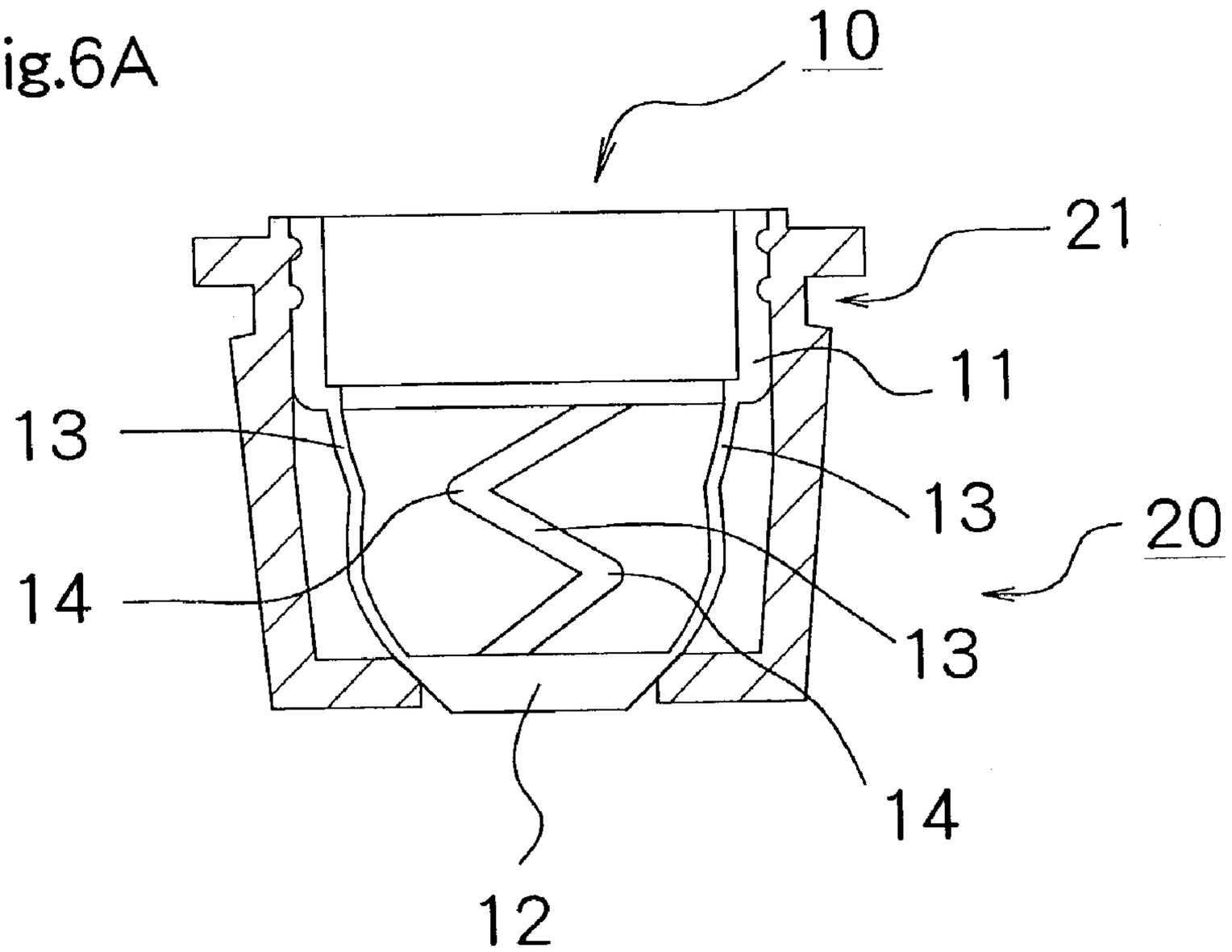
Fig.6A



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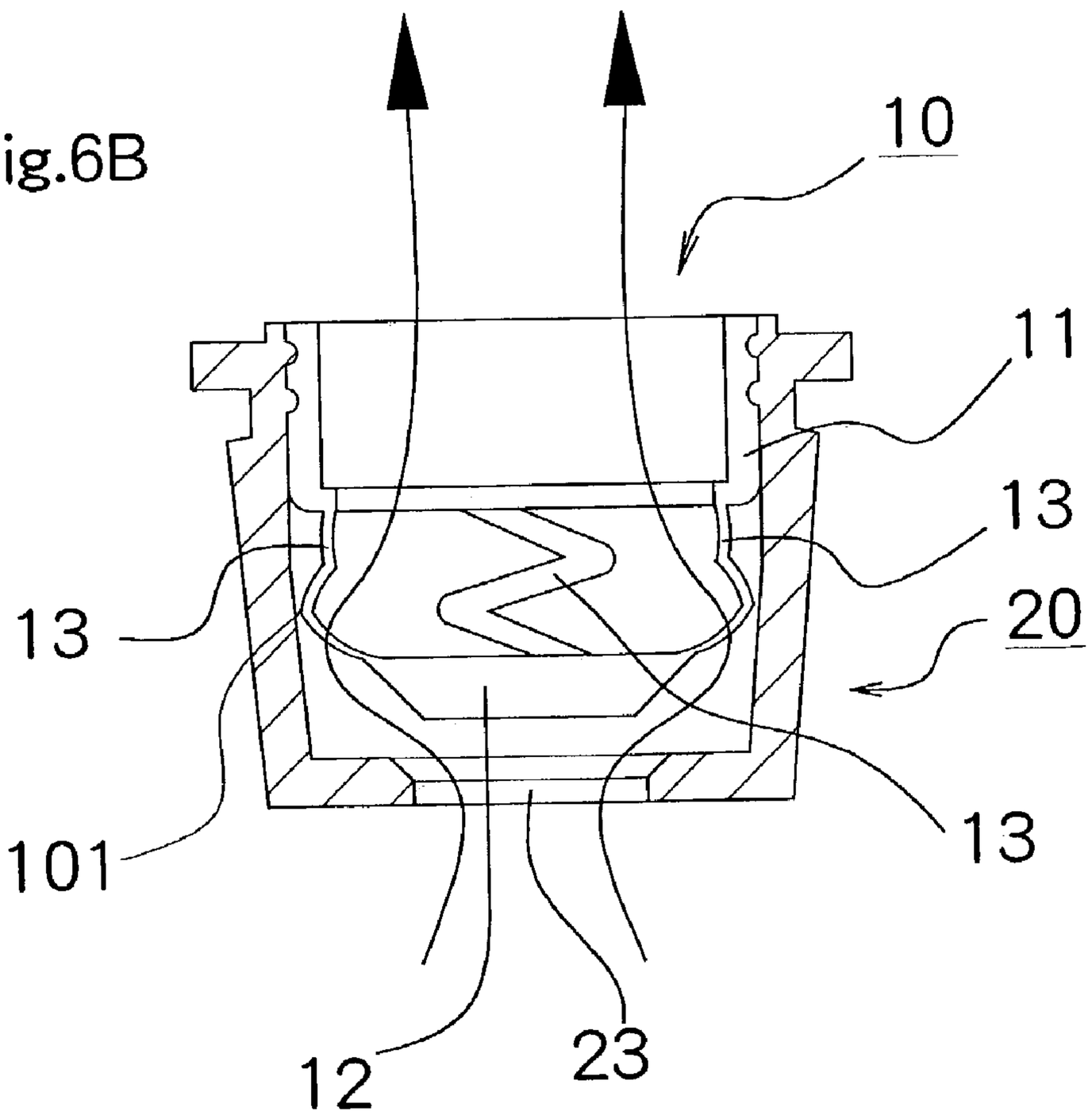

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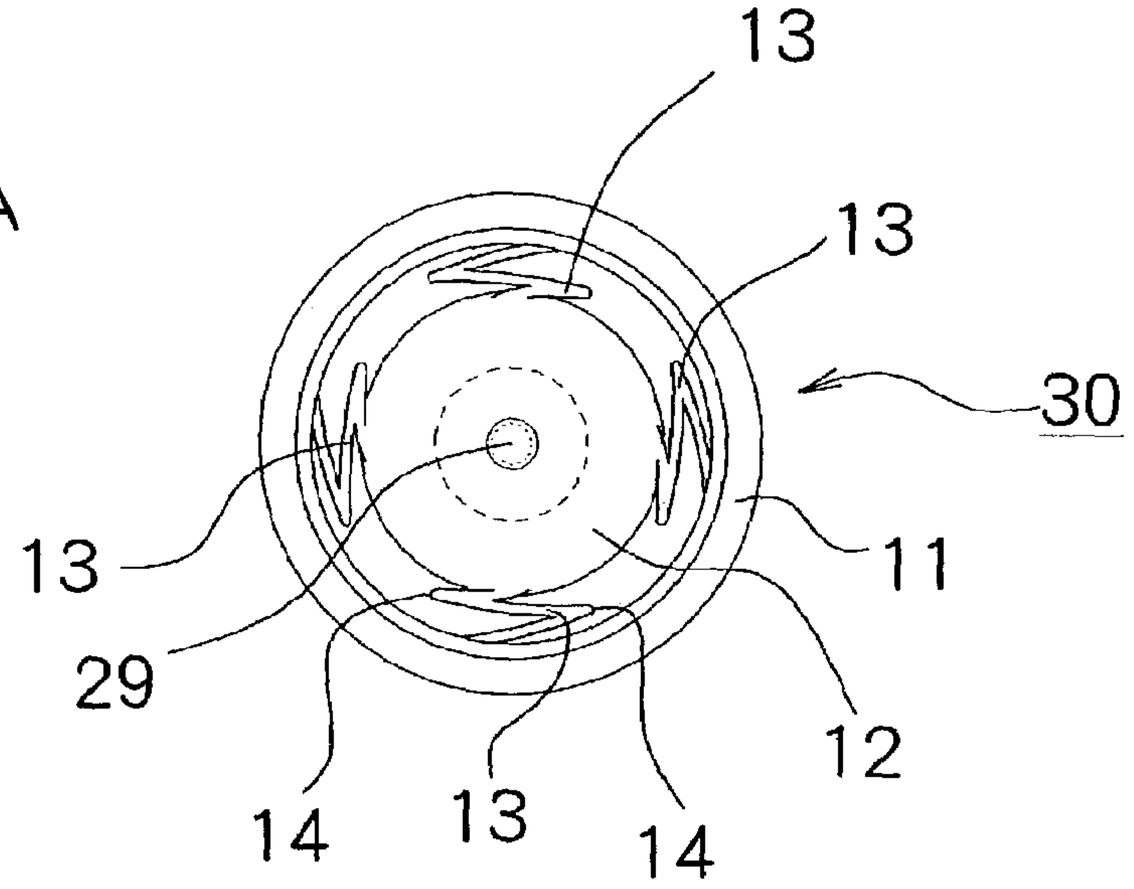
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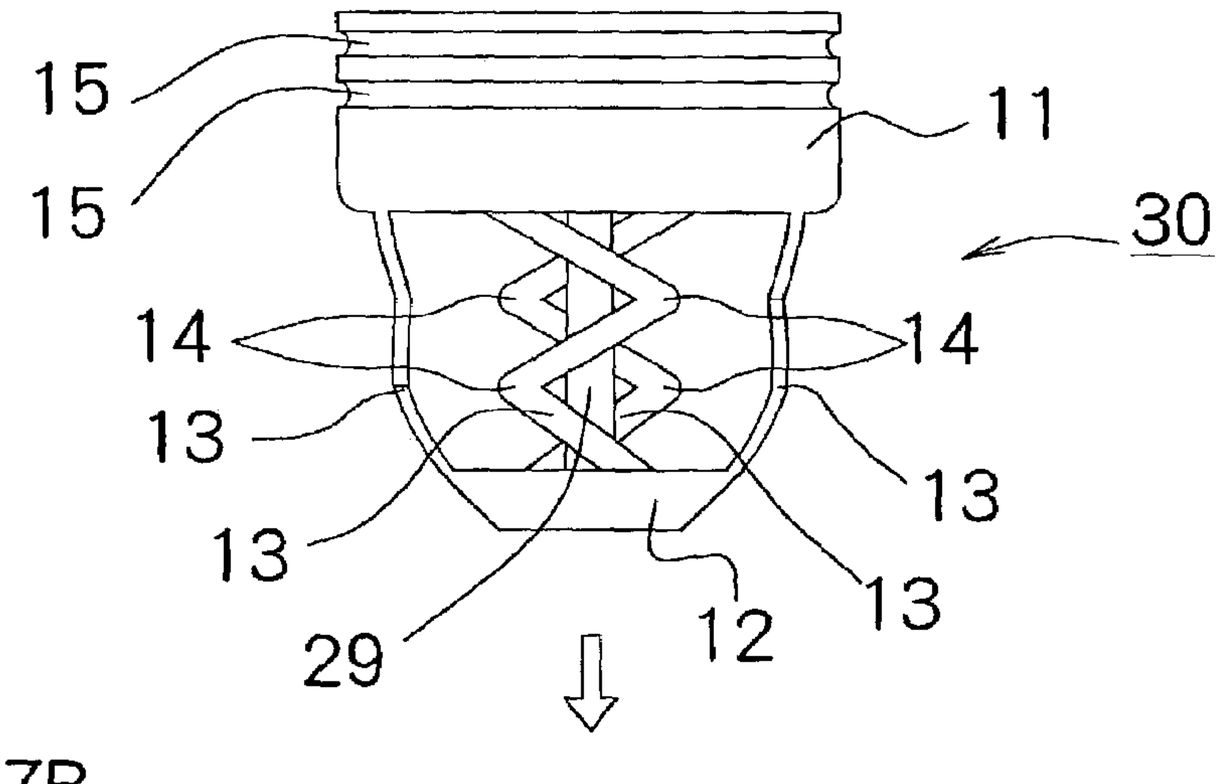
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Fig.7B

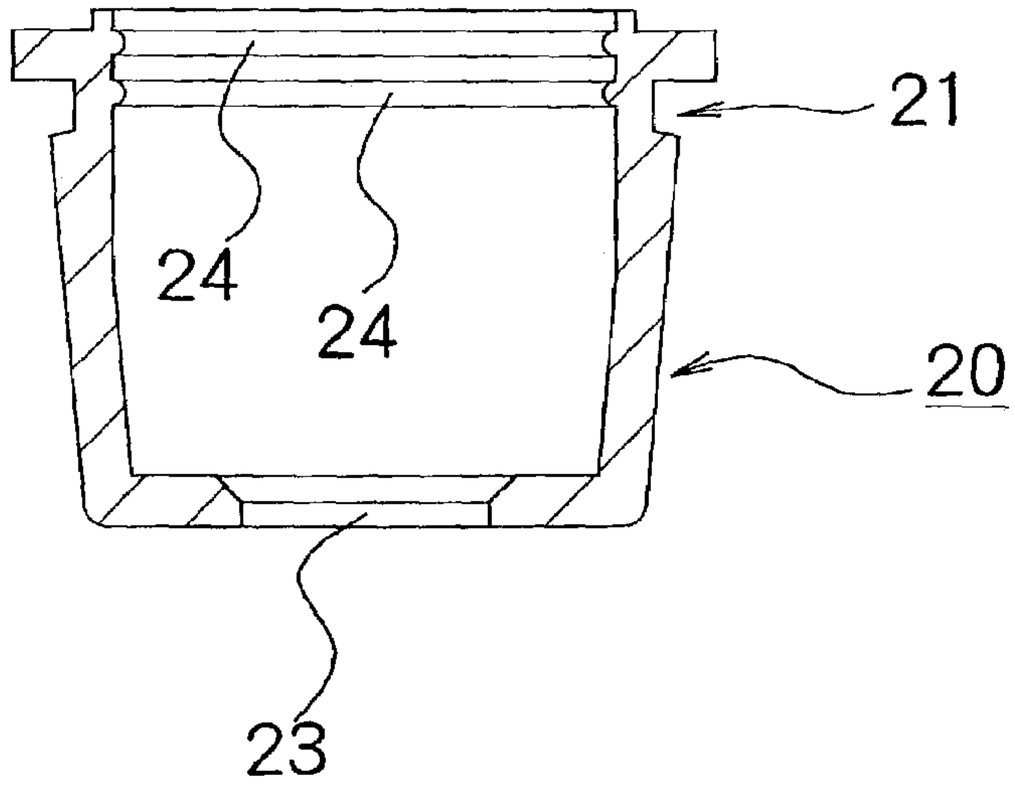
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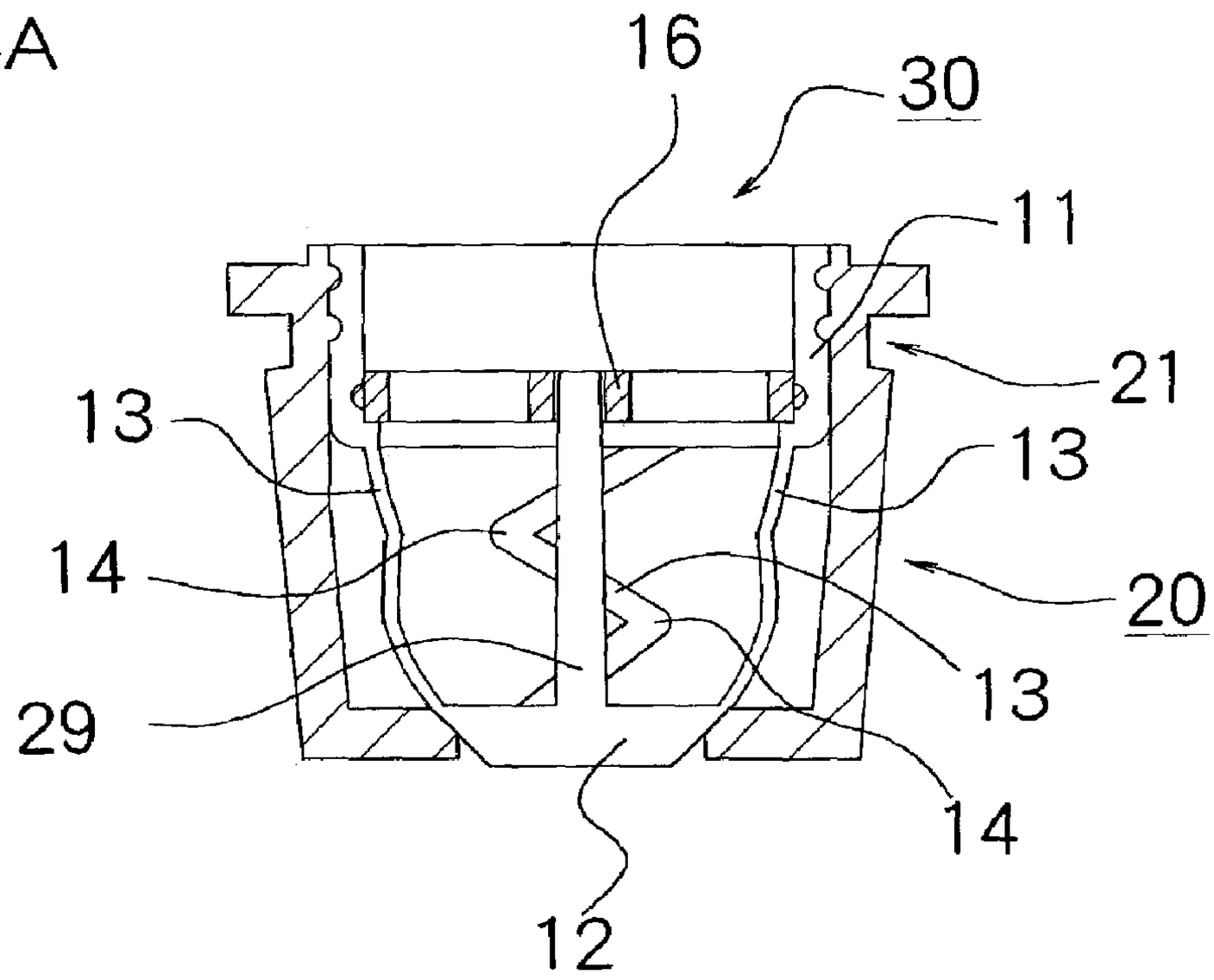
Fig.8A



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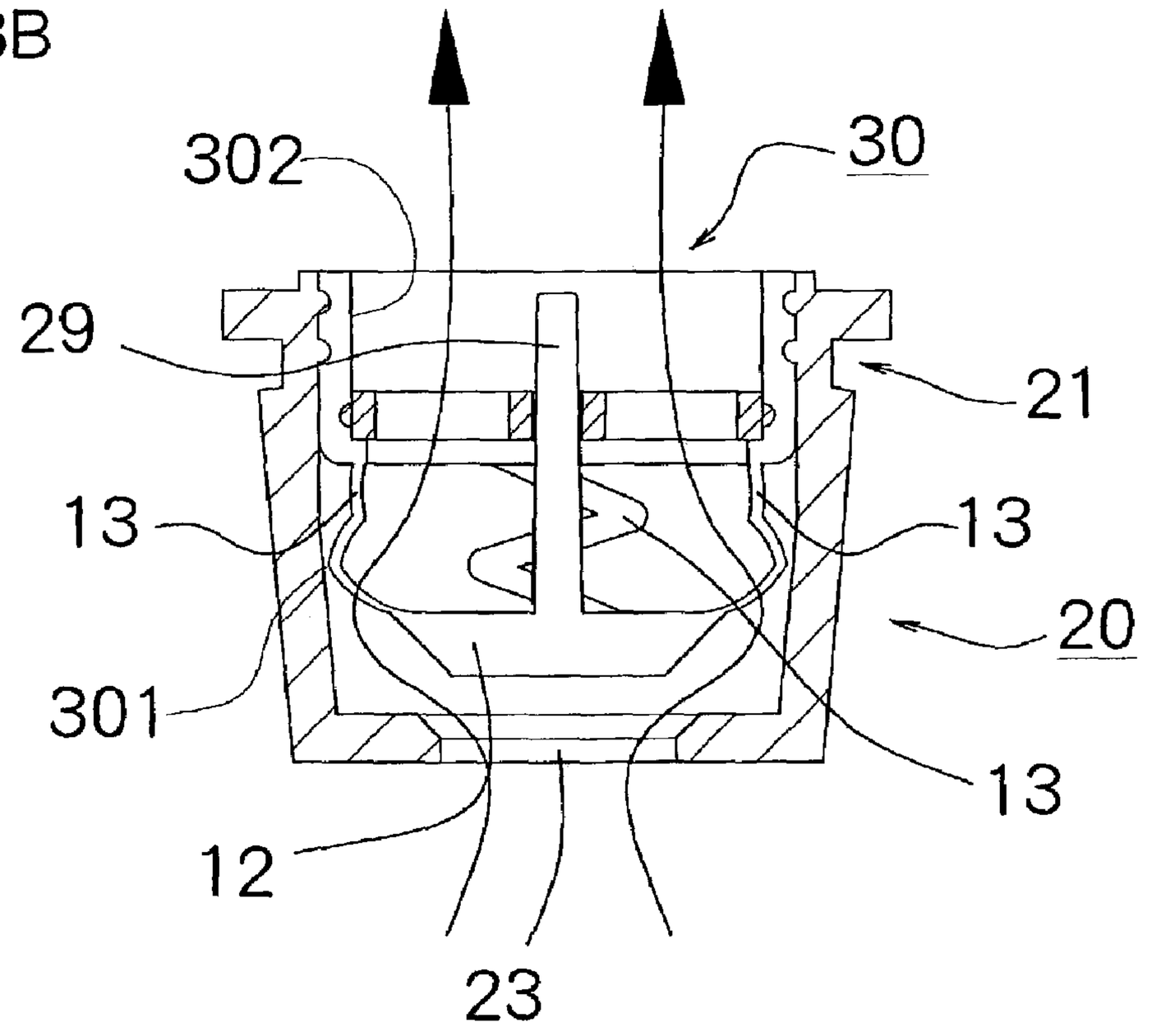

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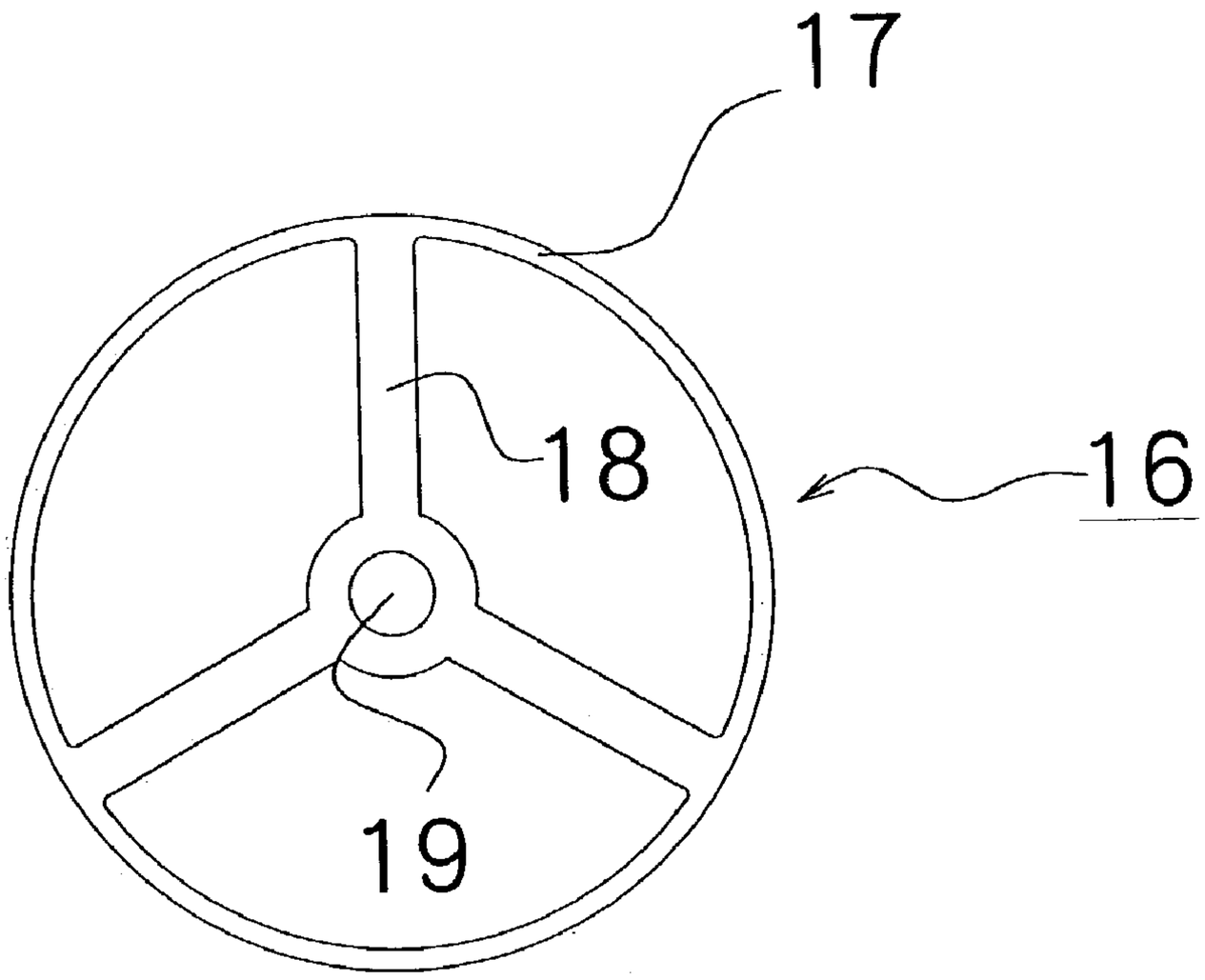

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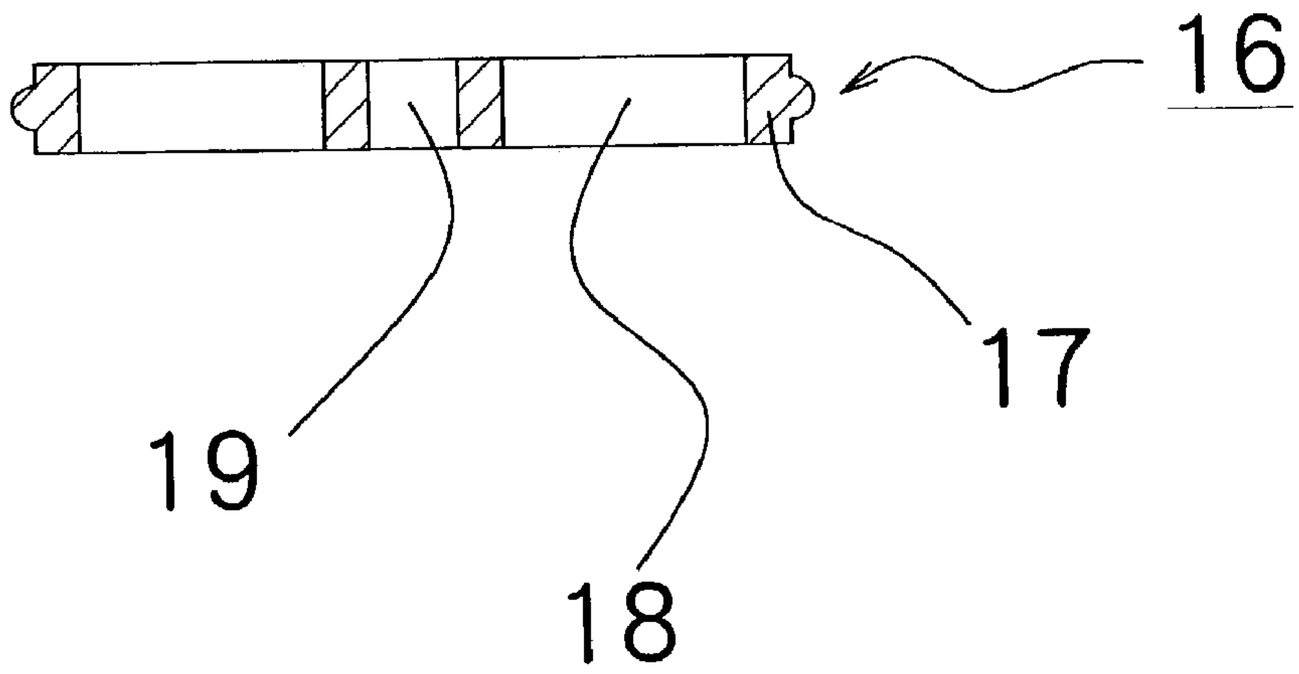

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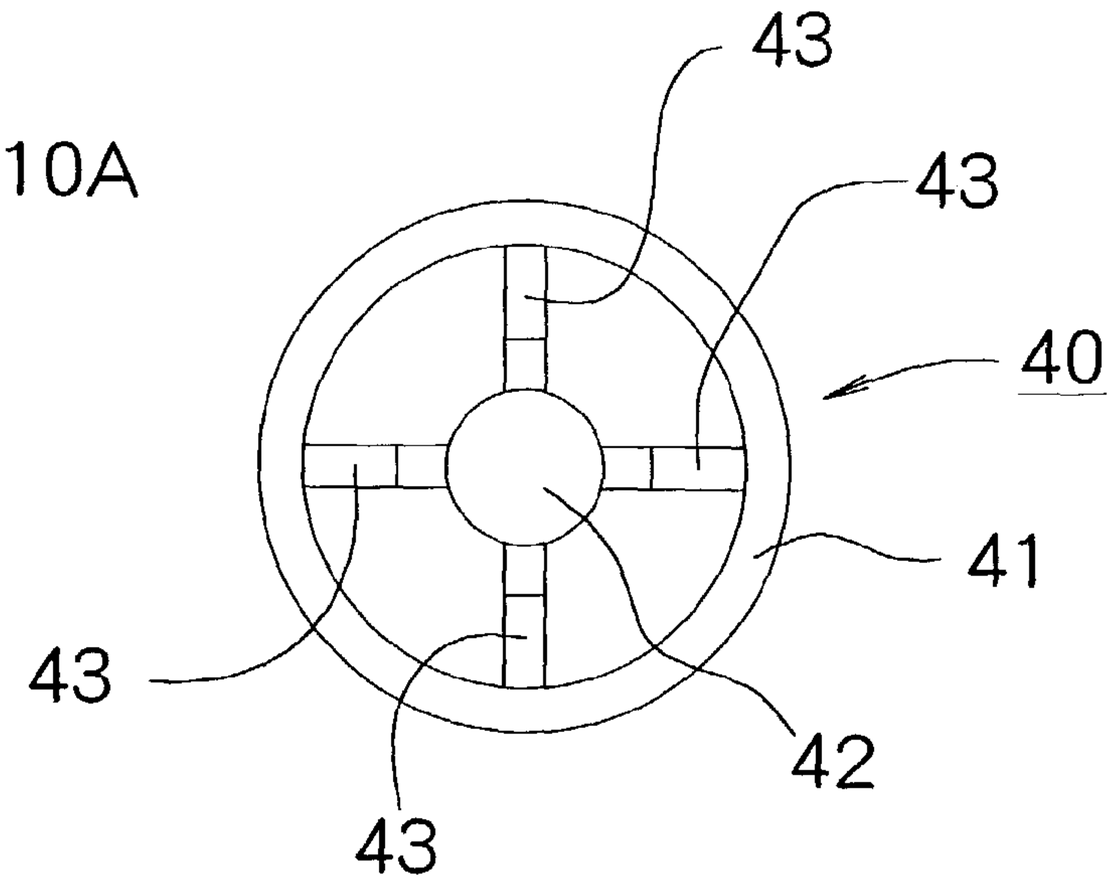

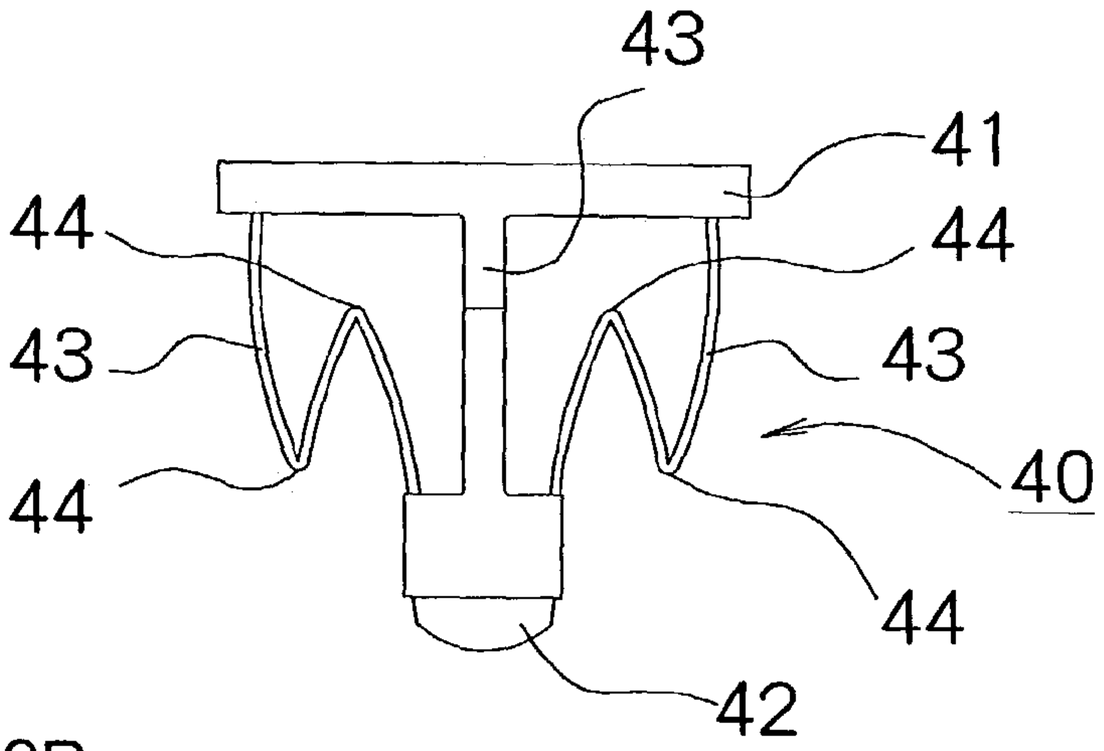

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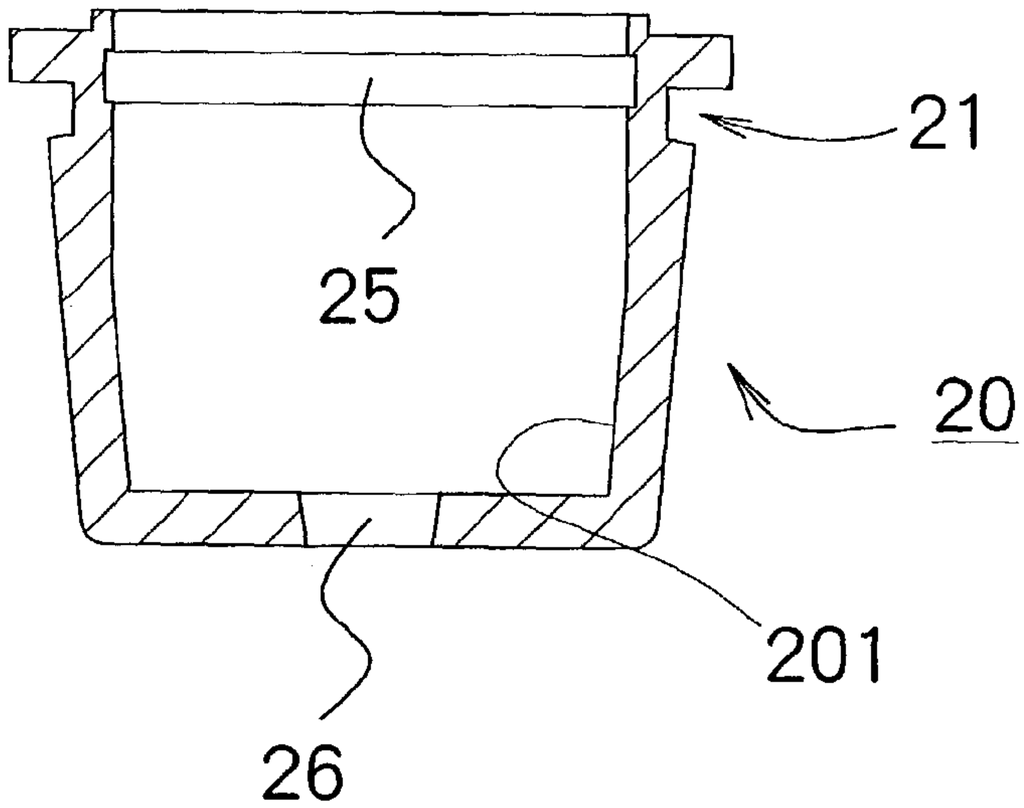

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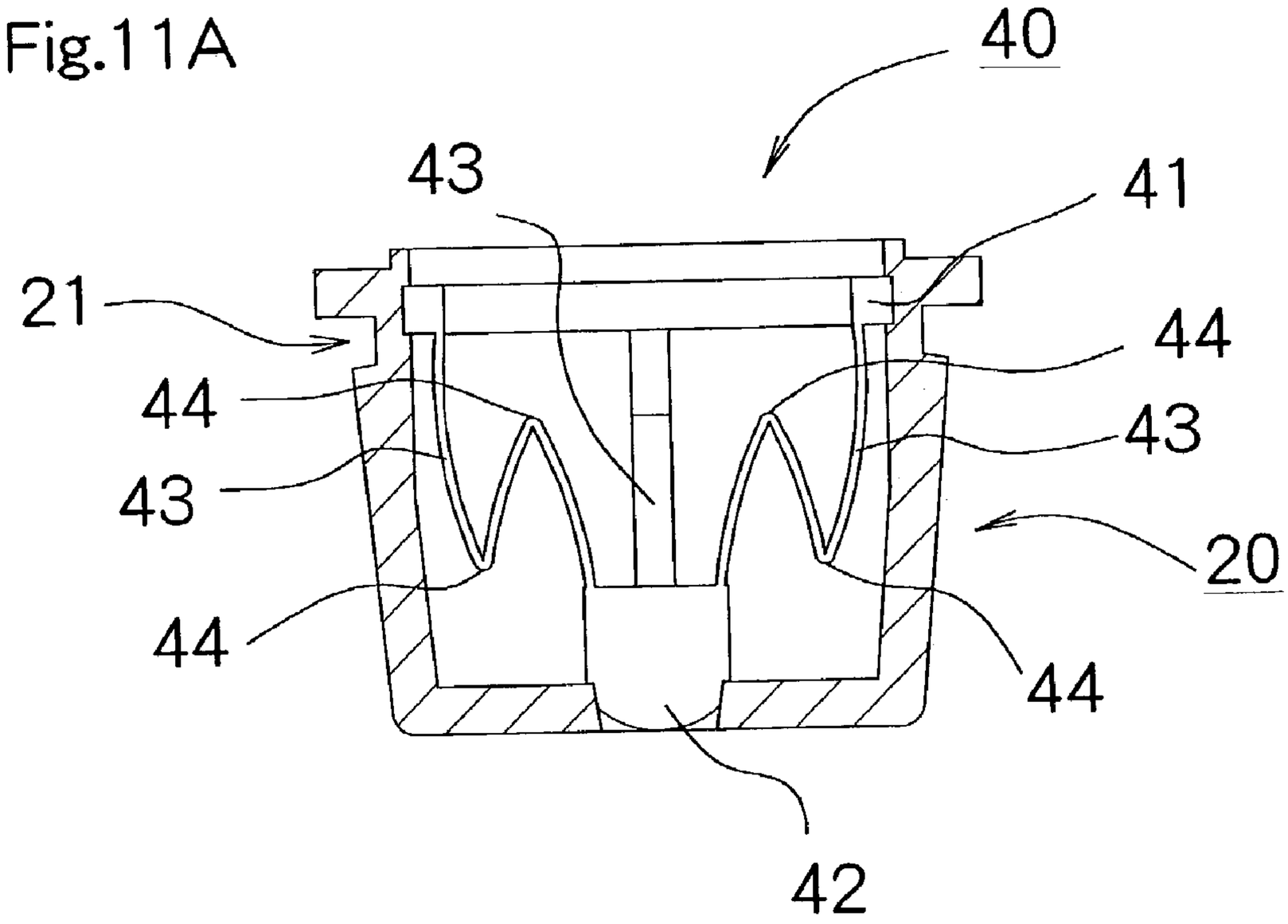

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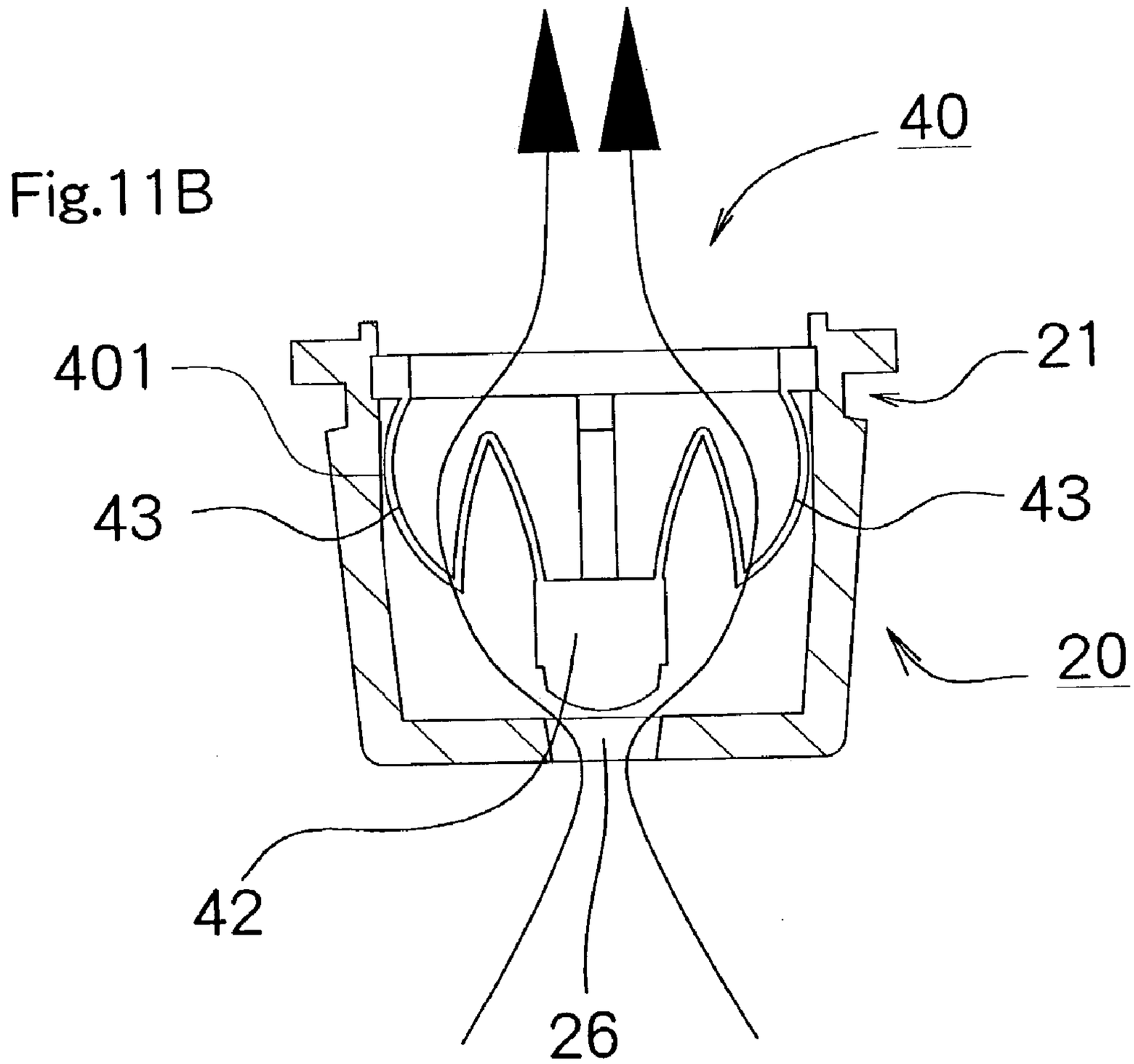

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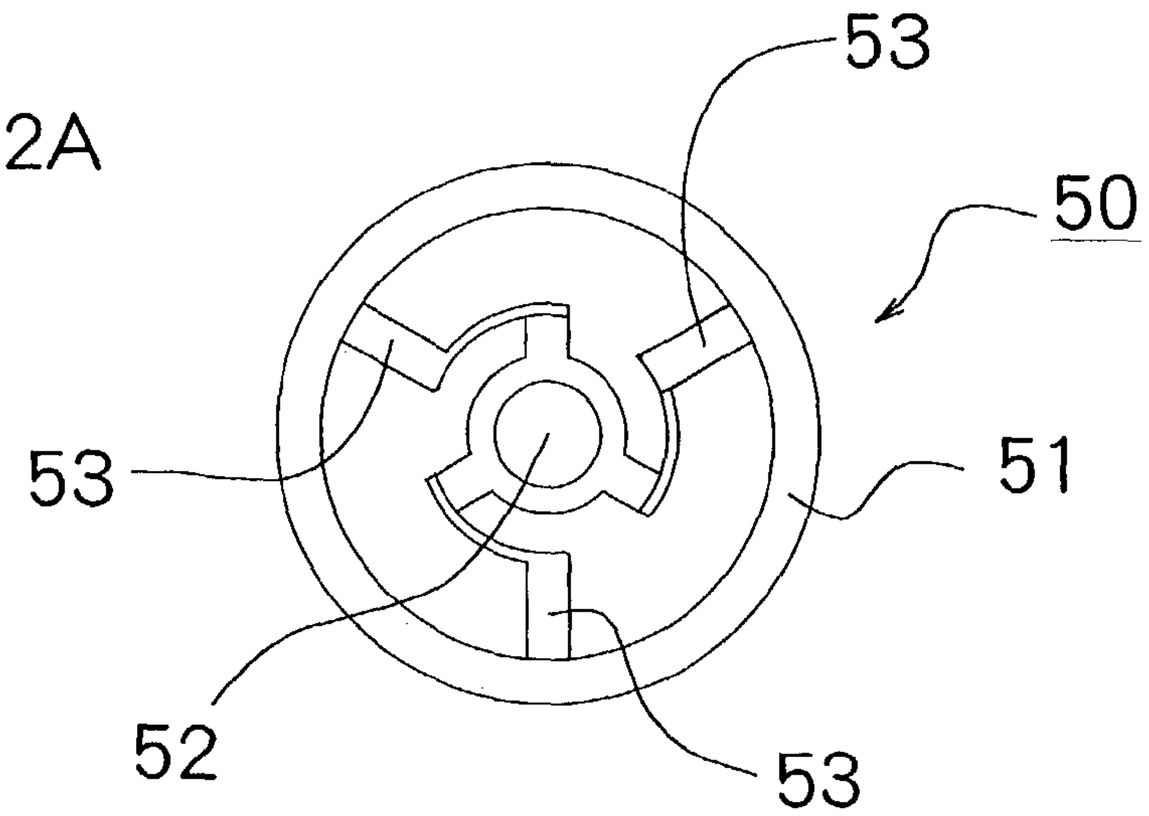

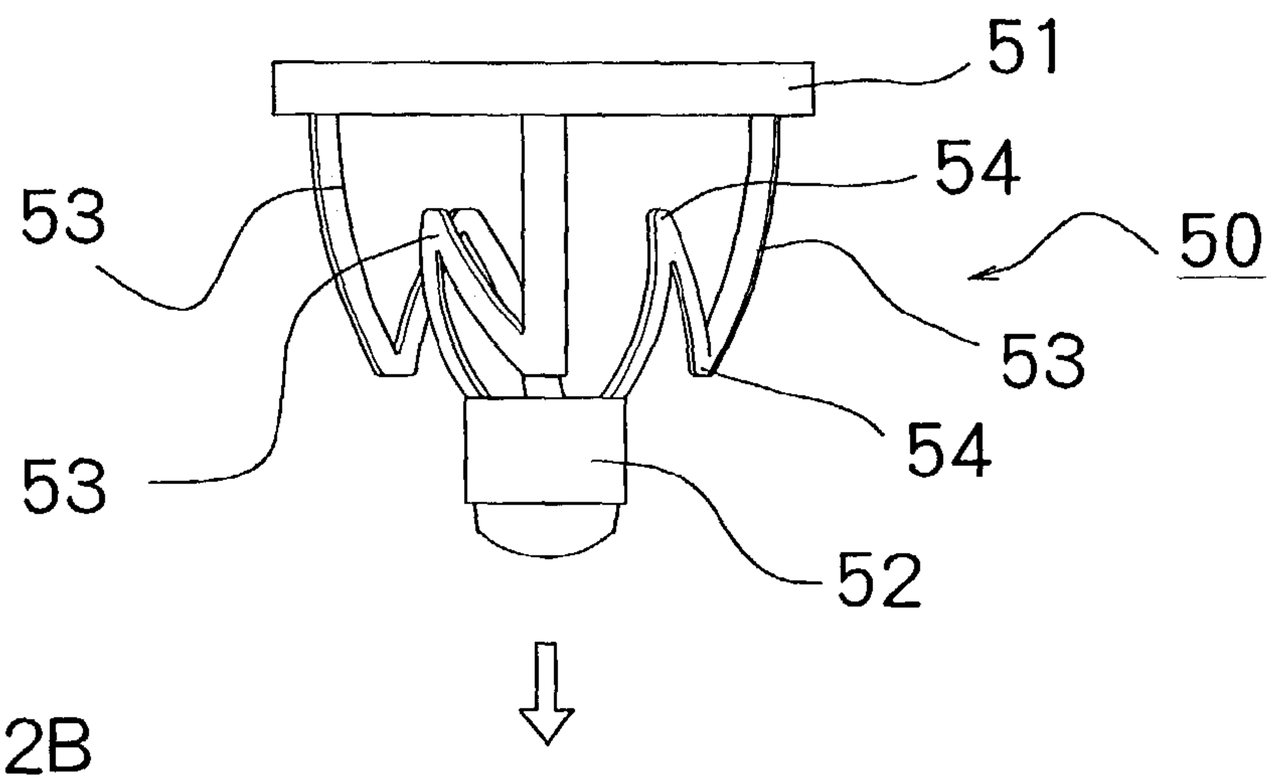

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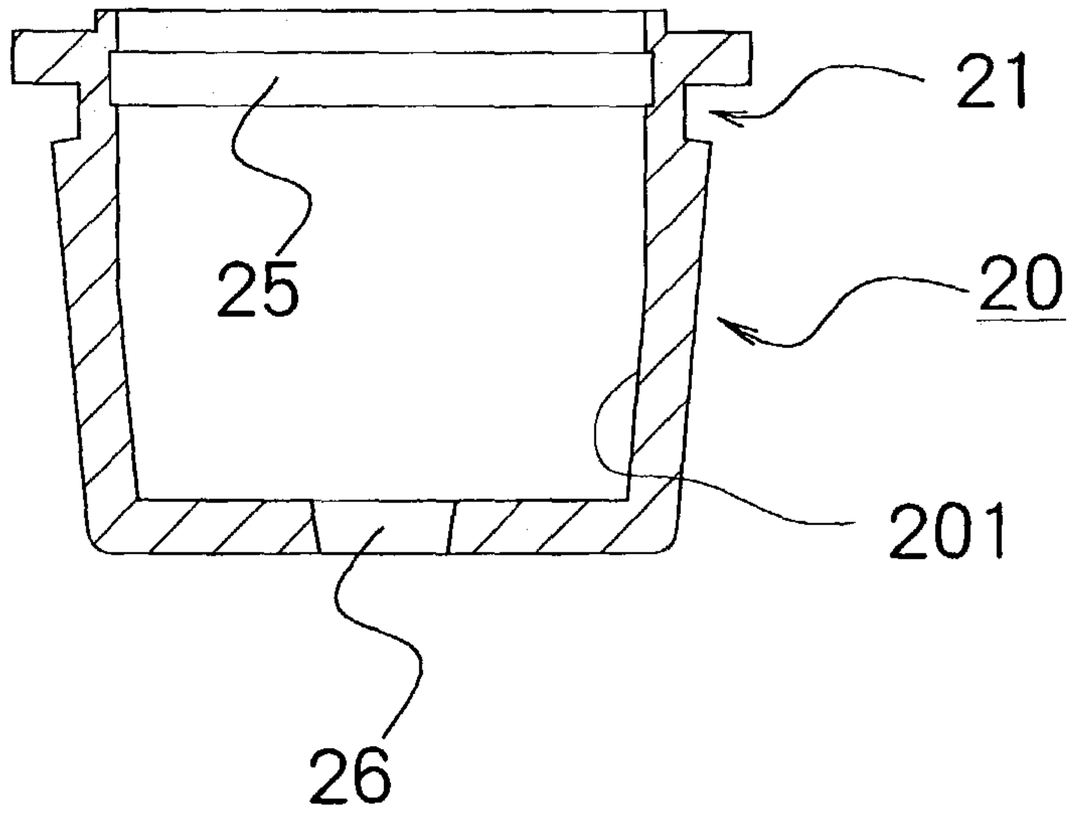

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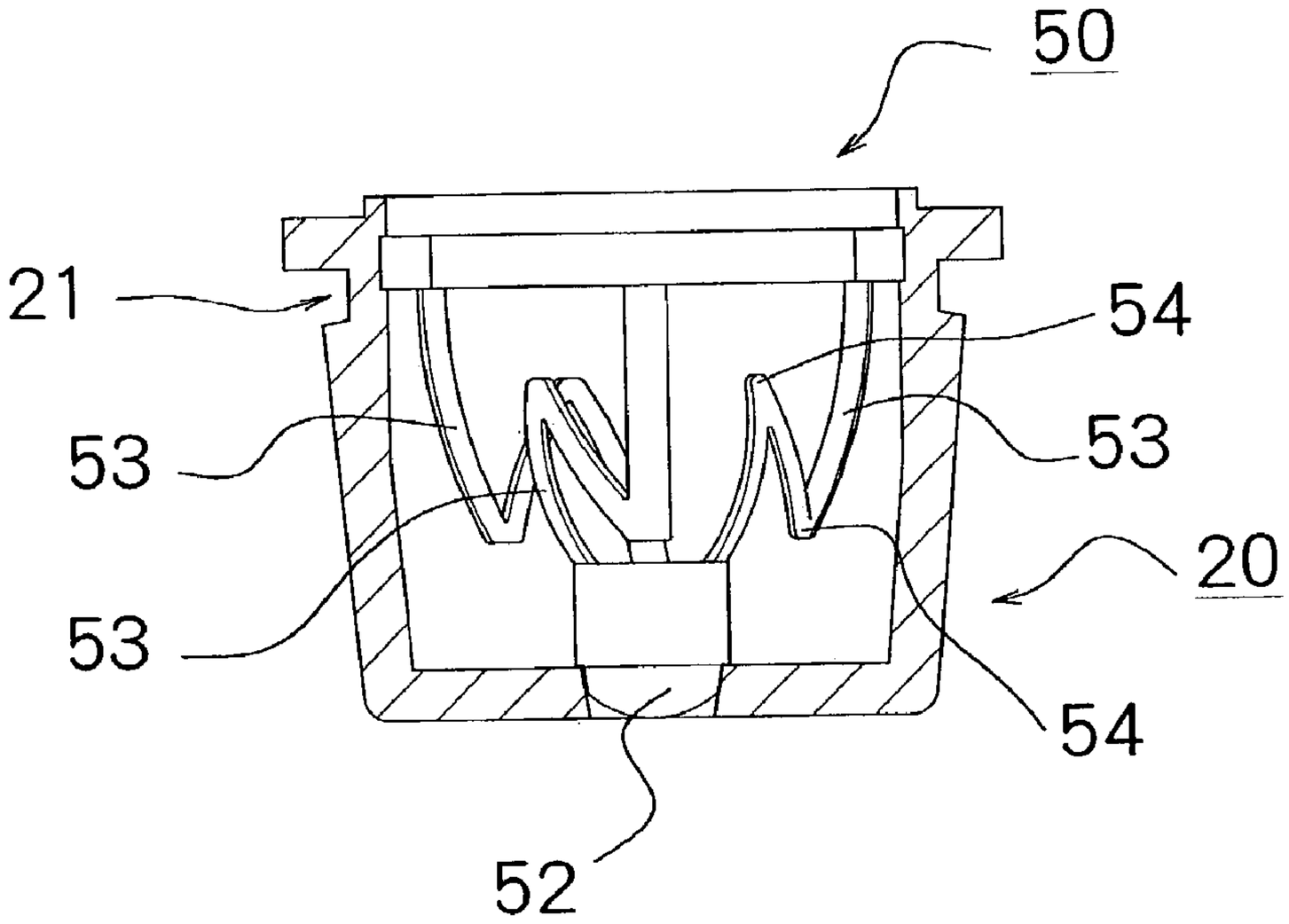

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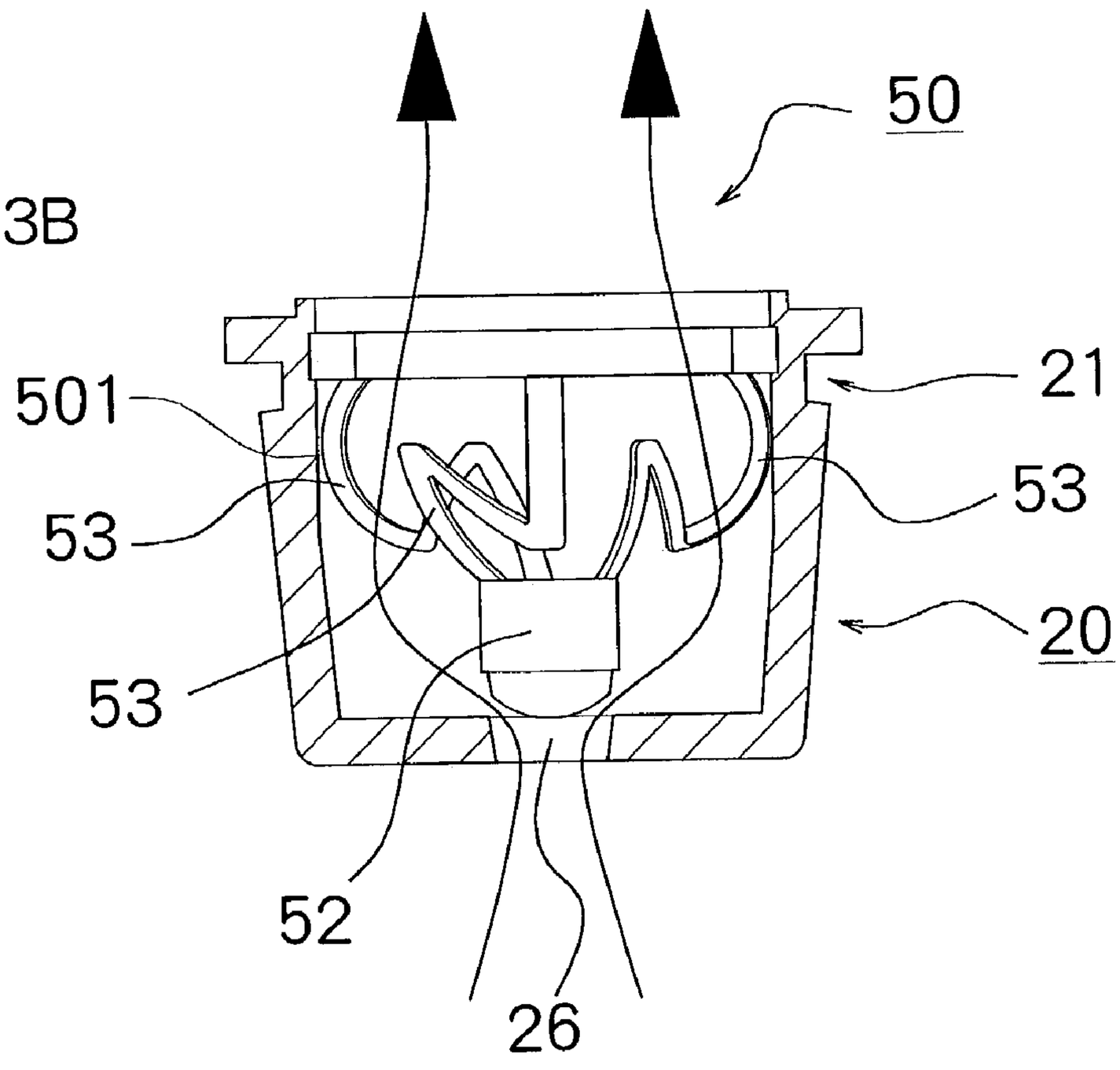

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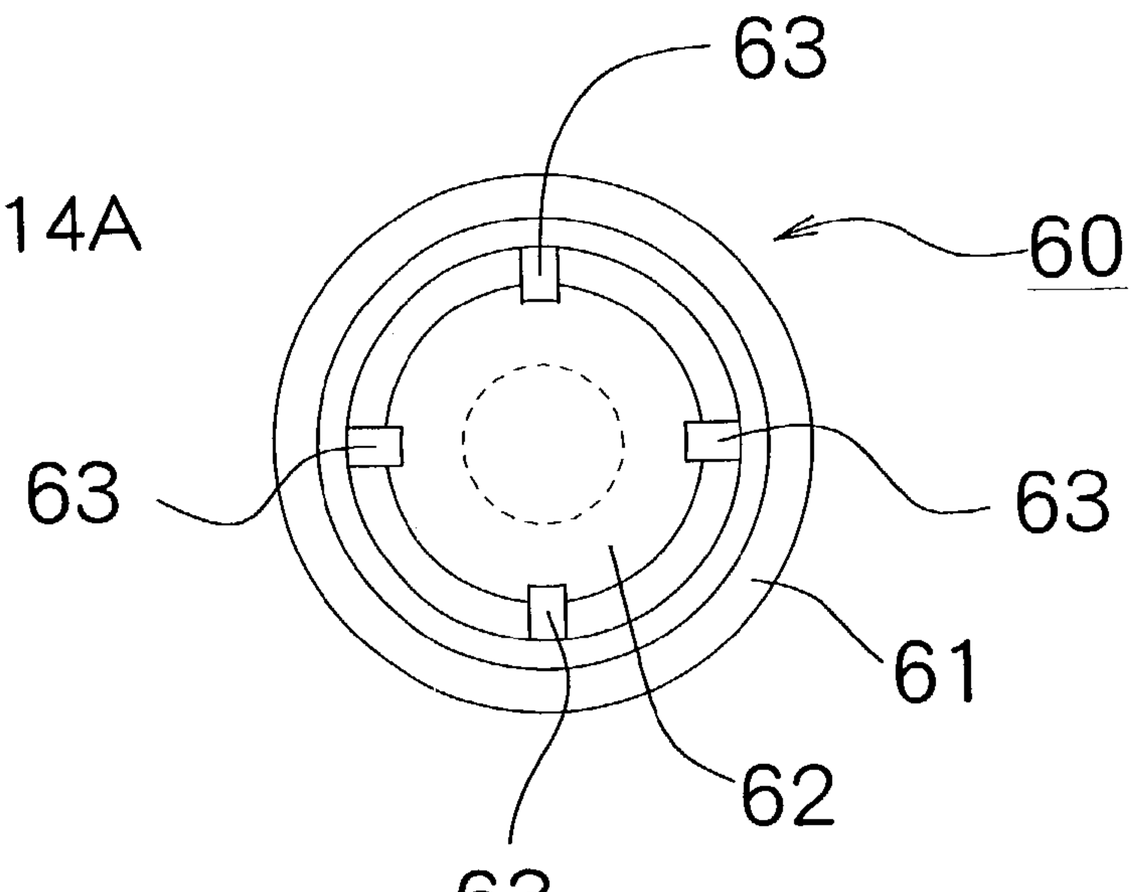

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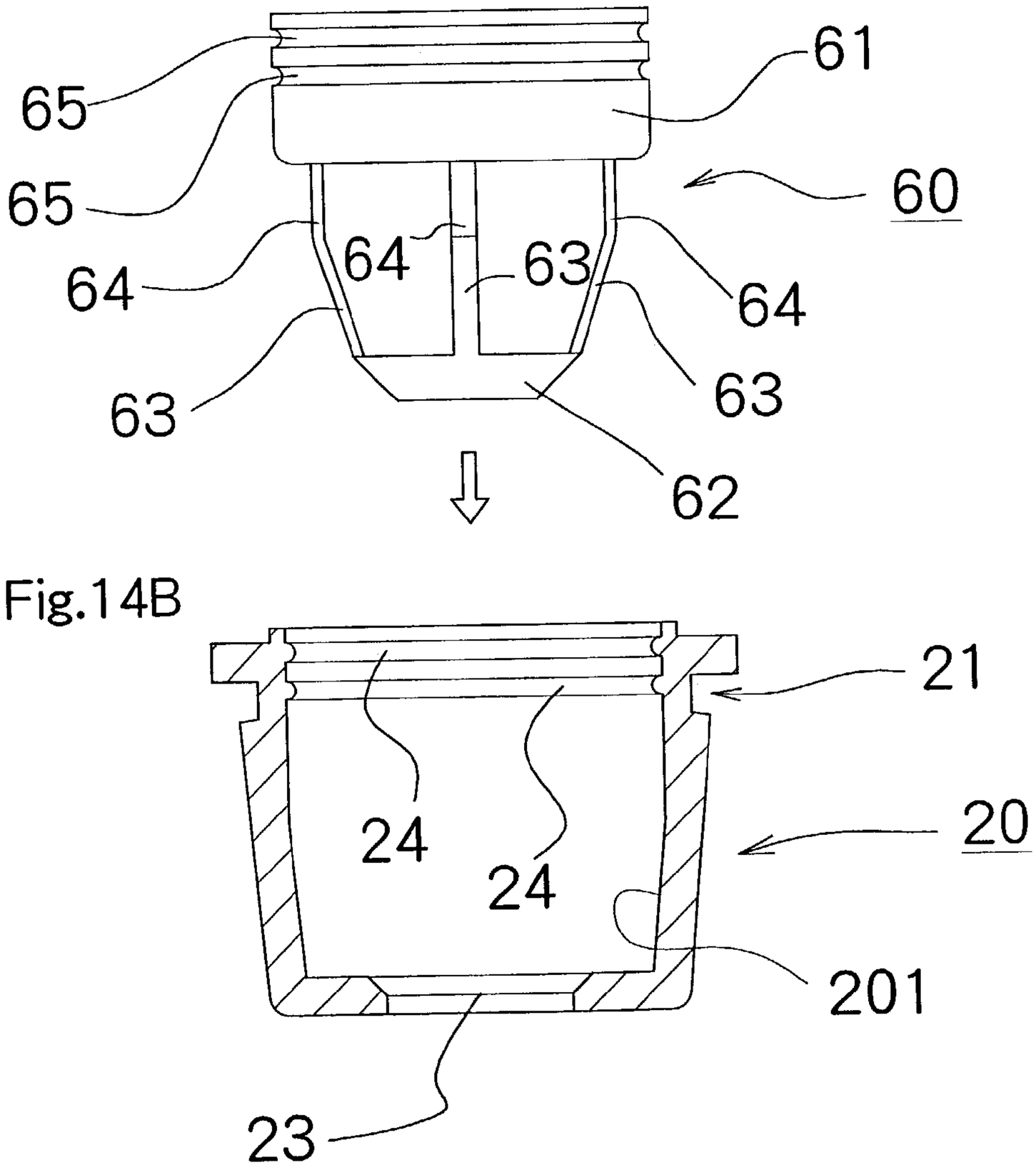

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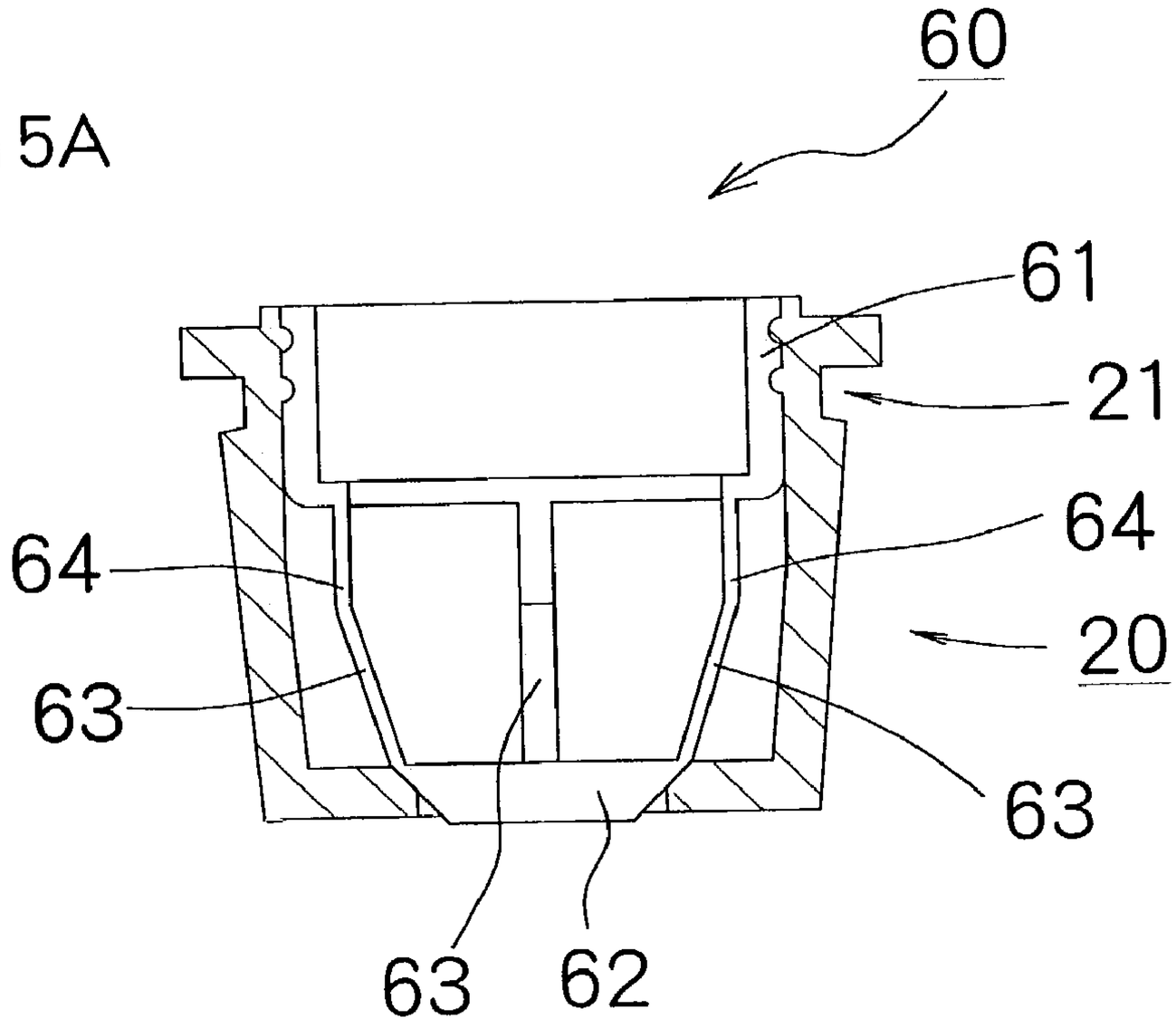

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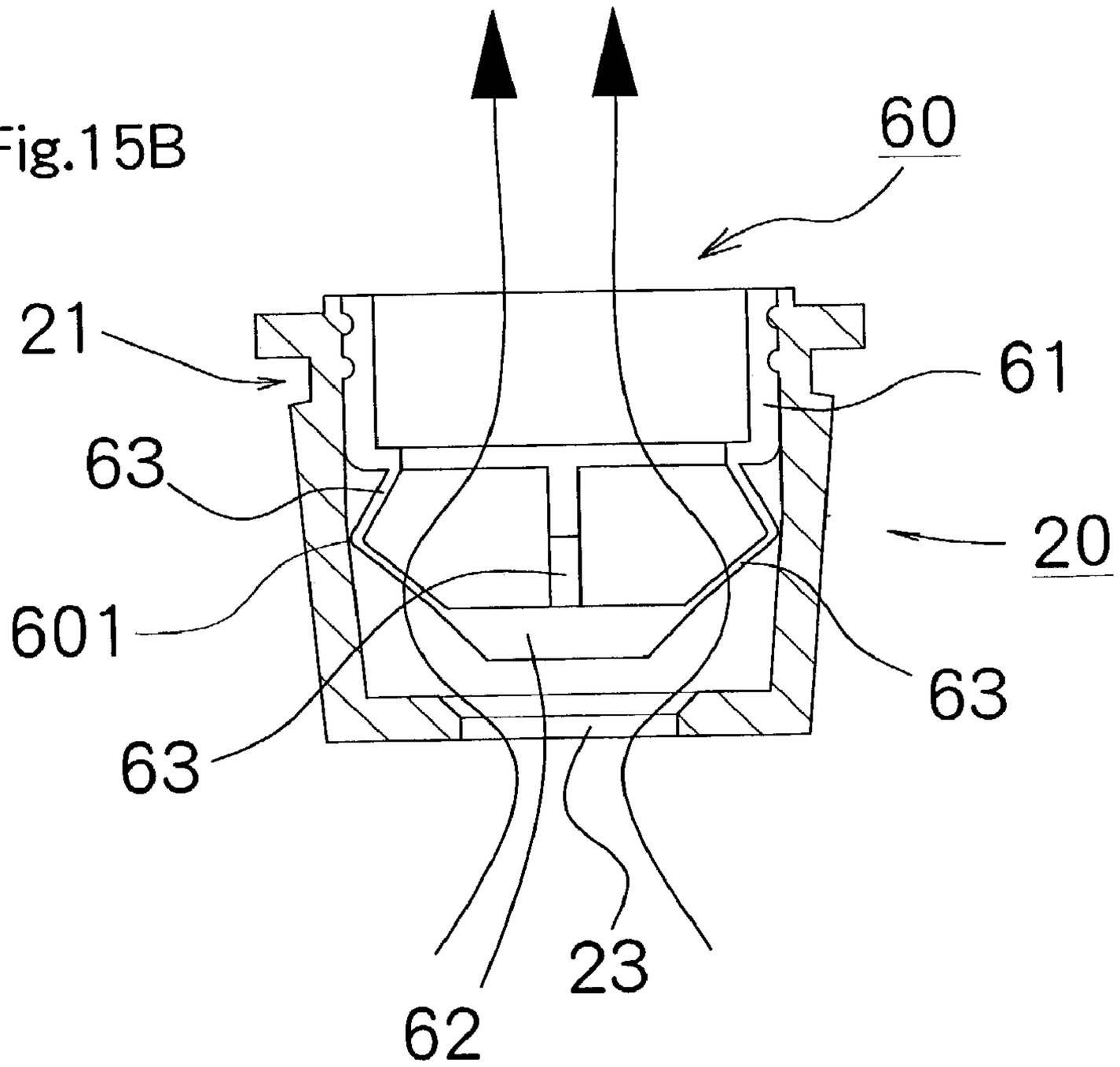

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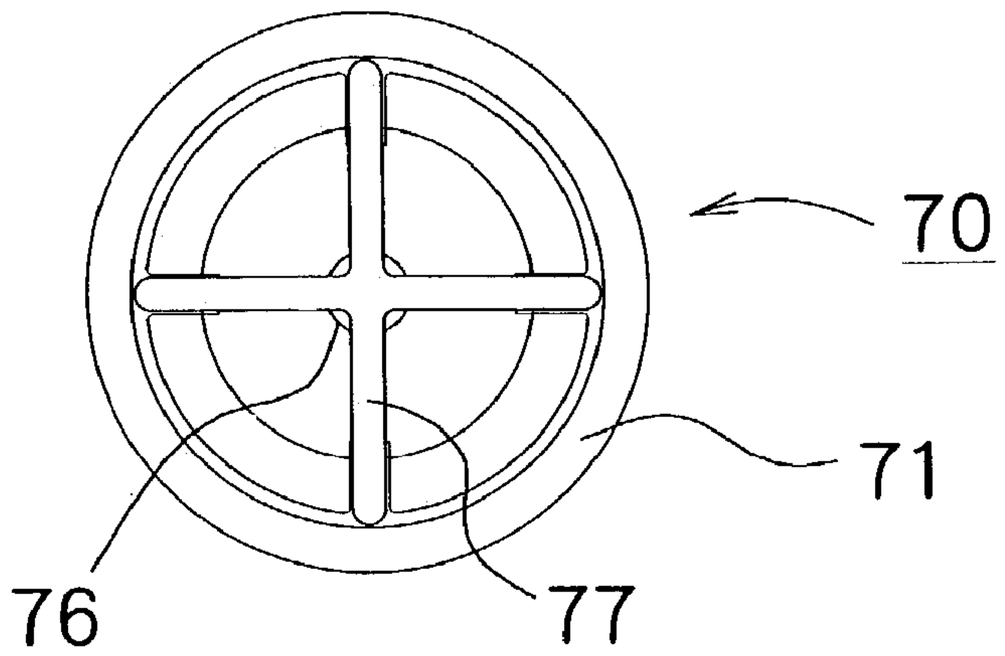

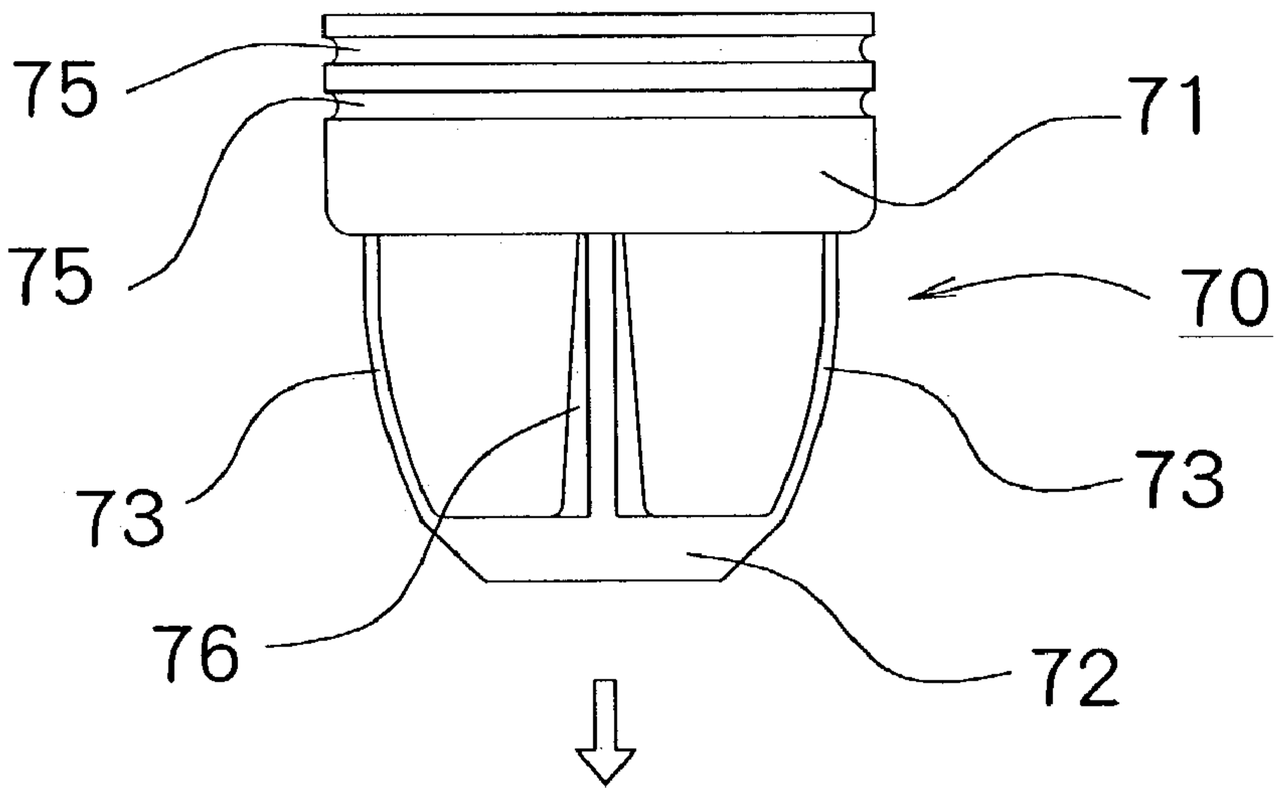

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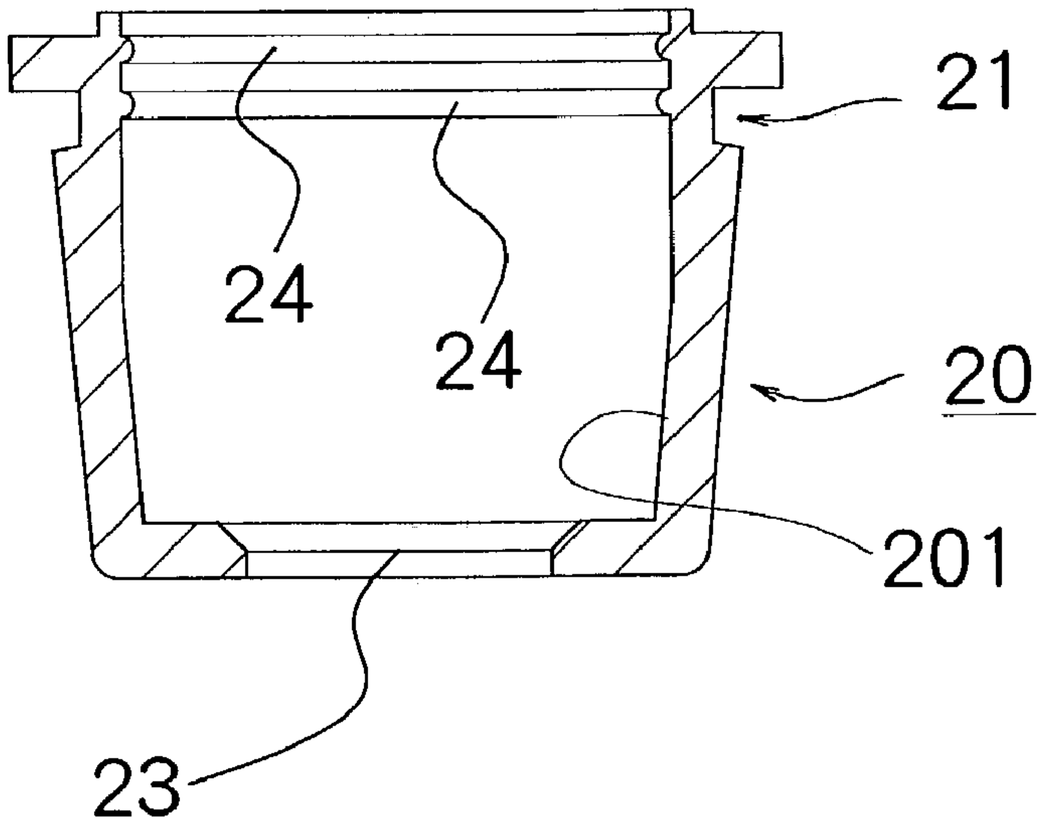

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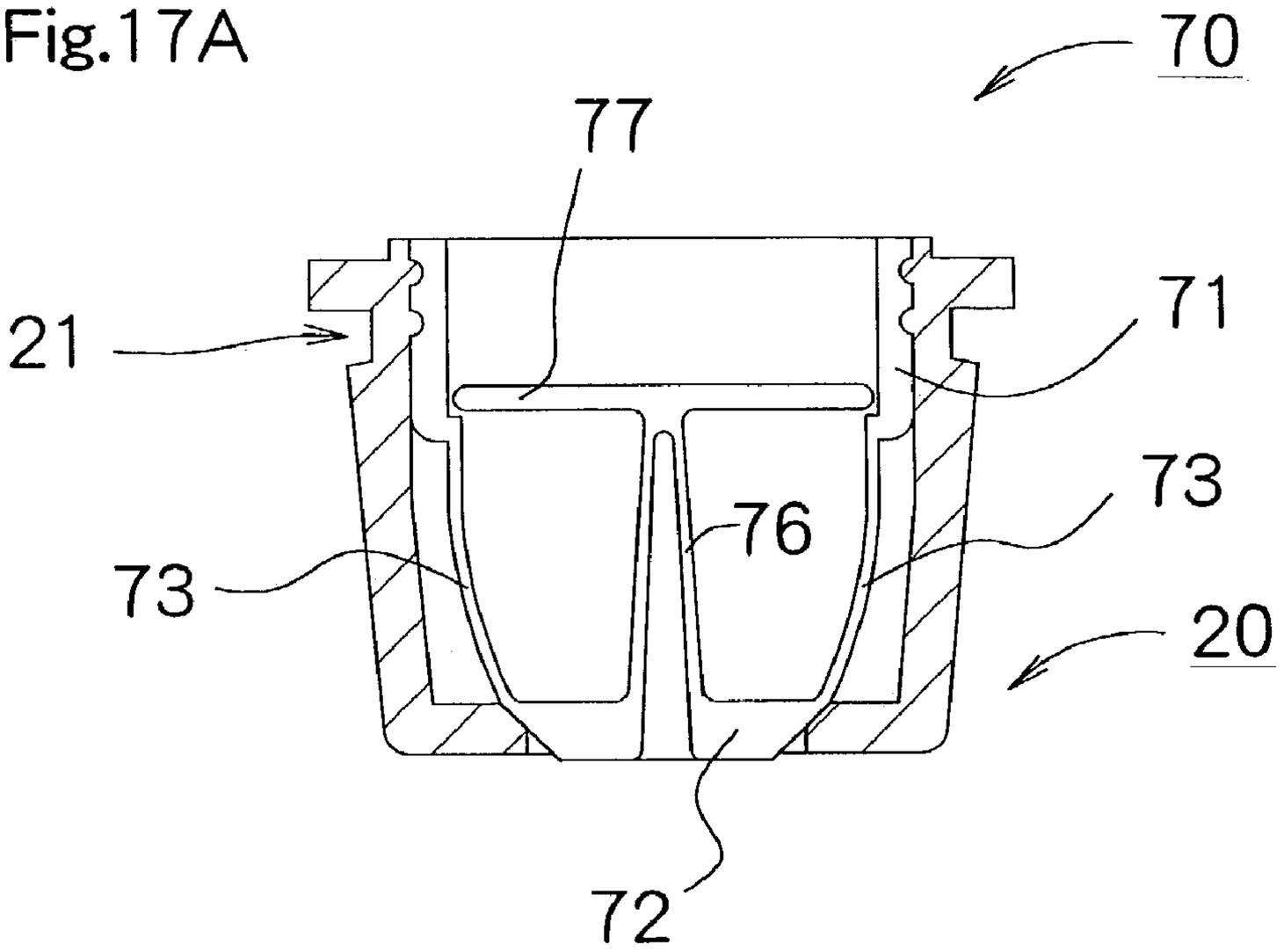

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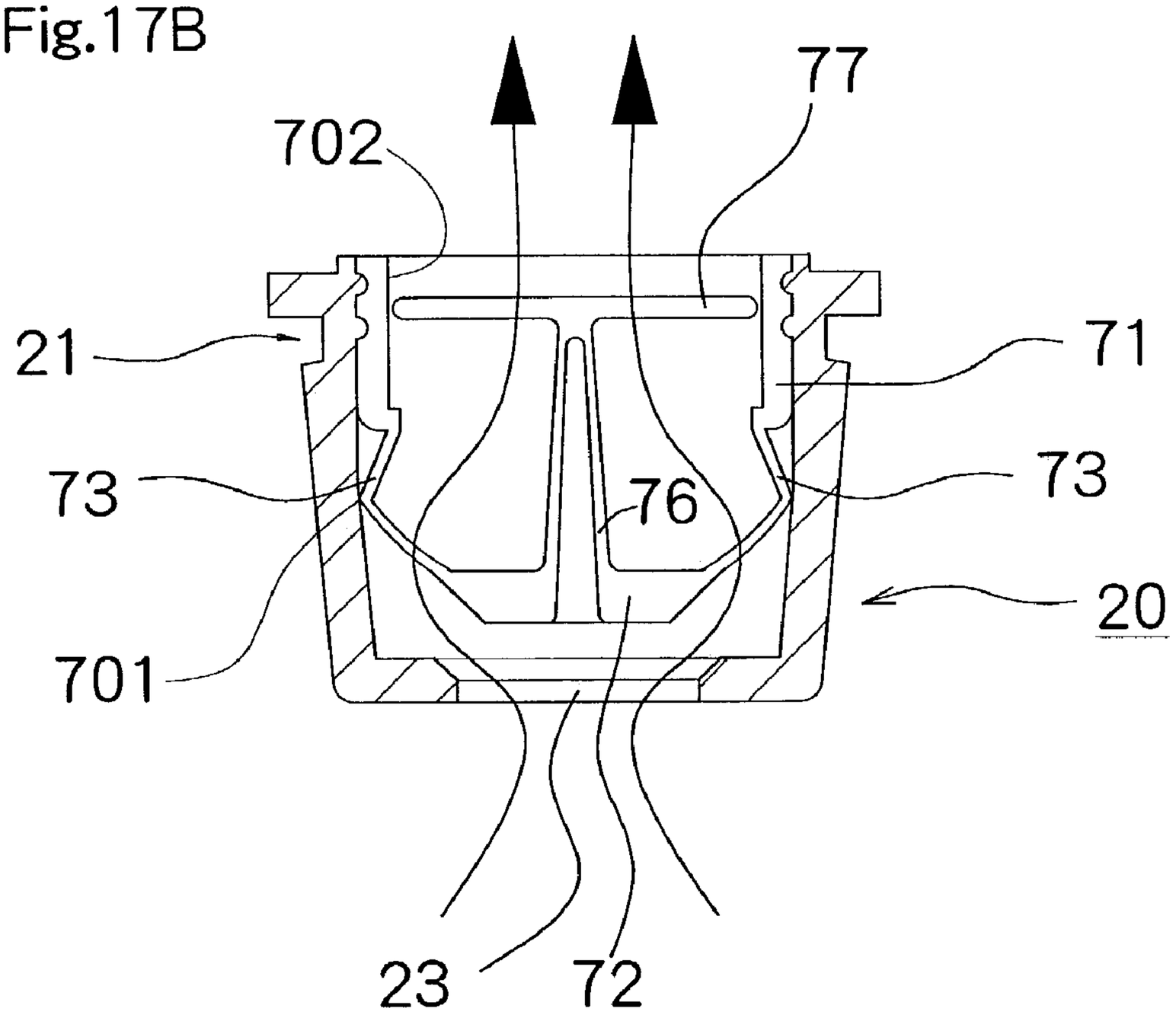

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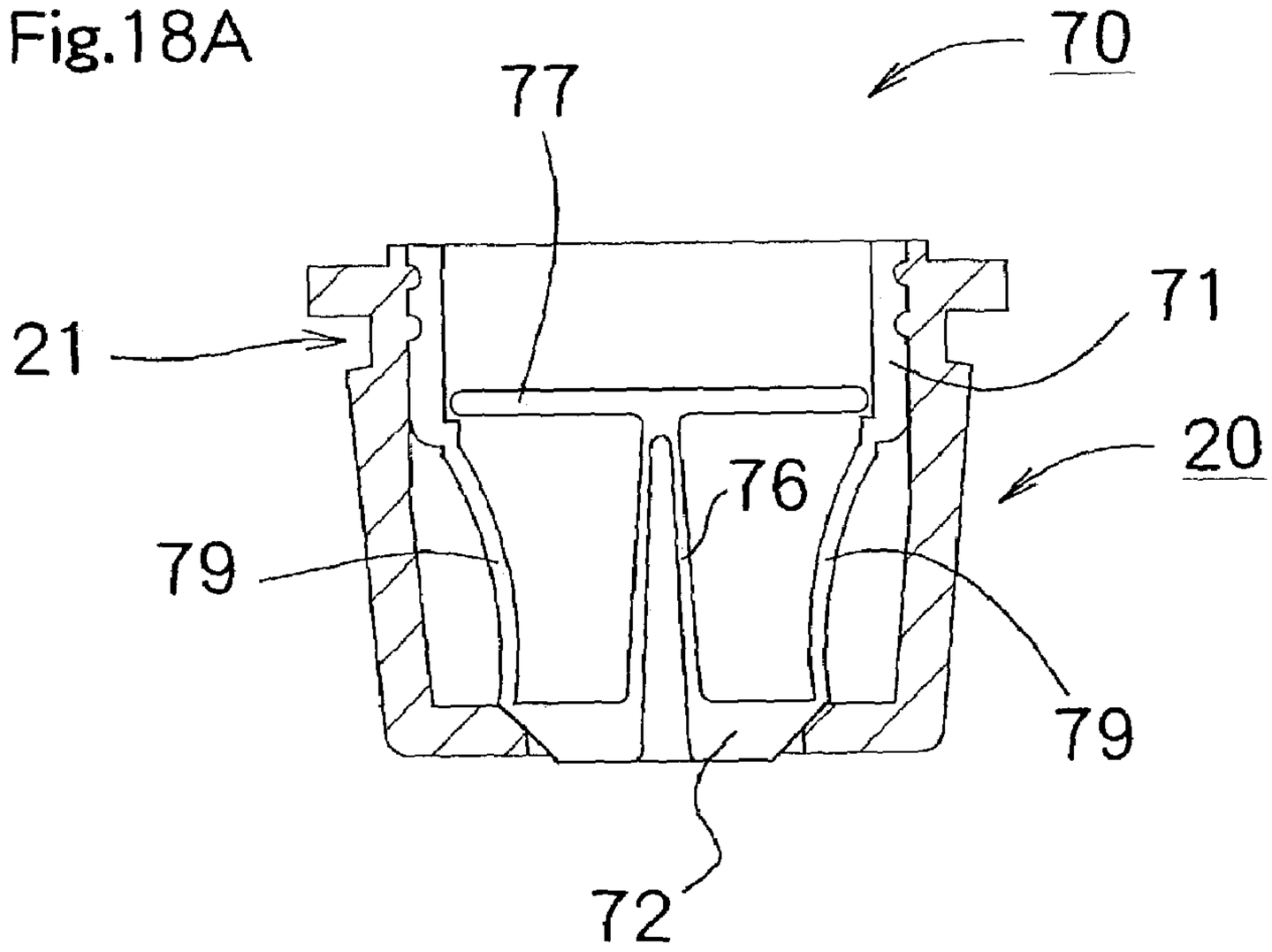

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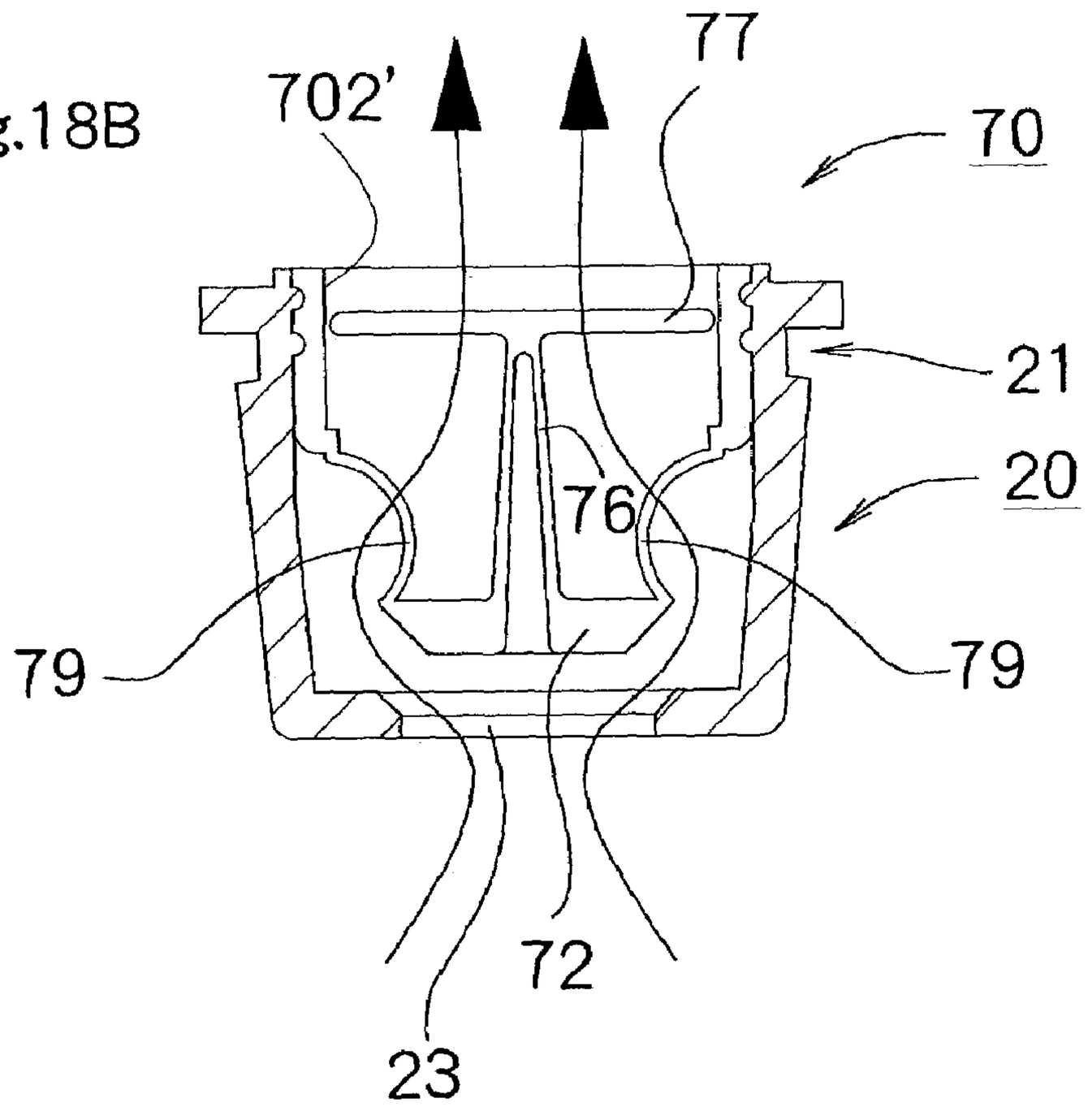

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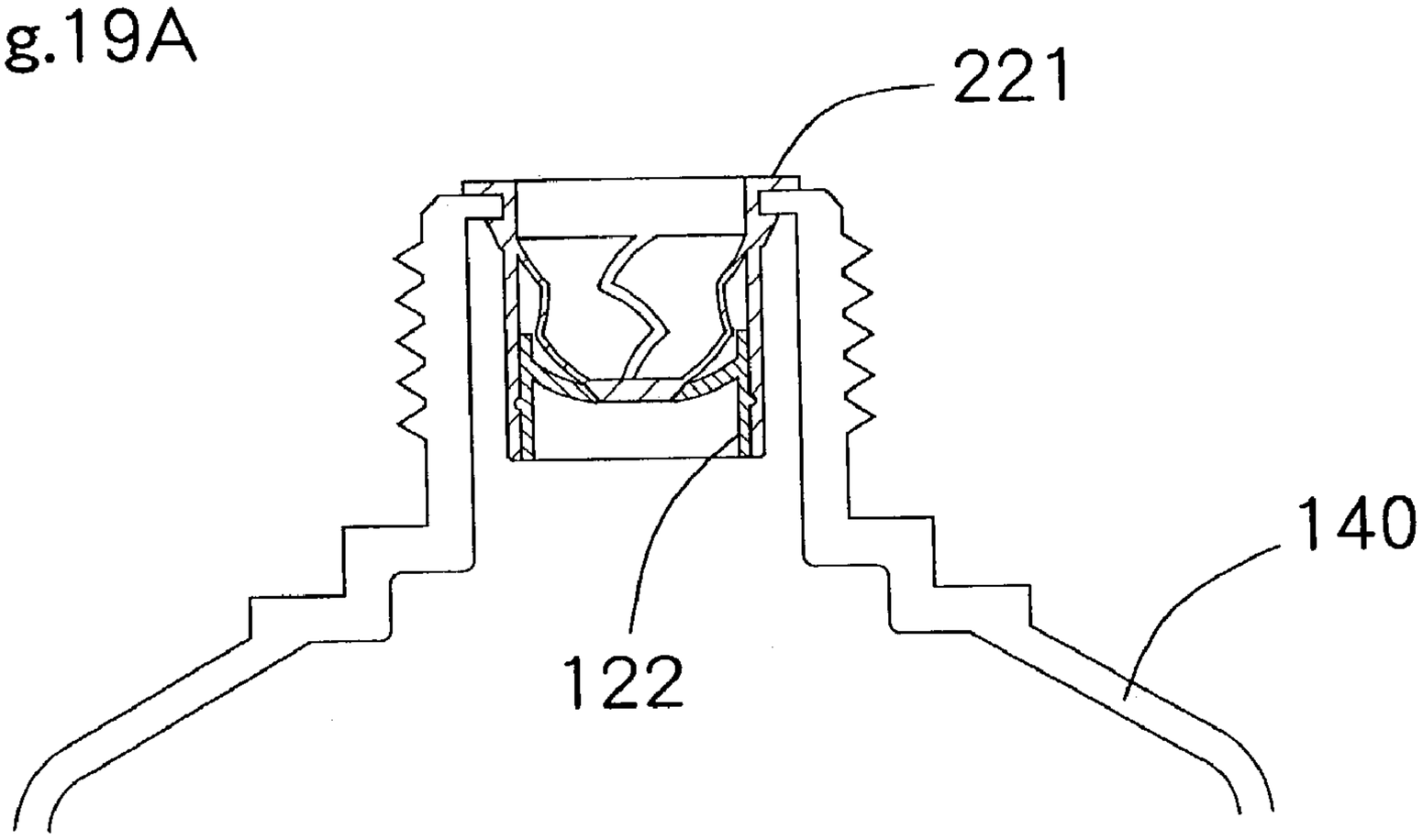

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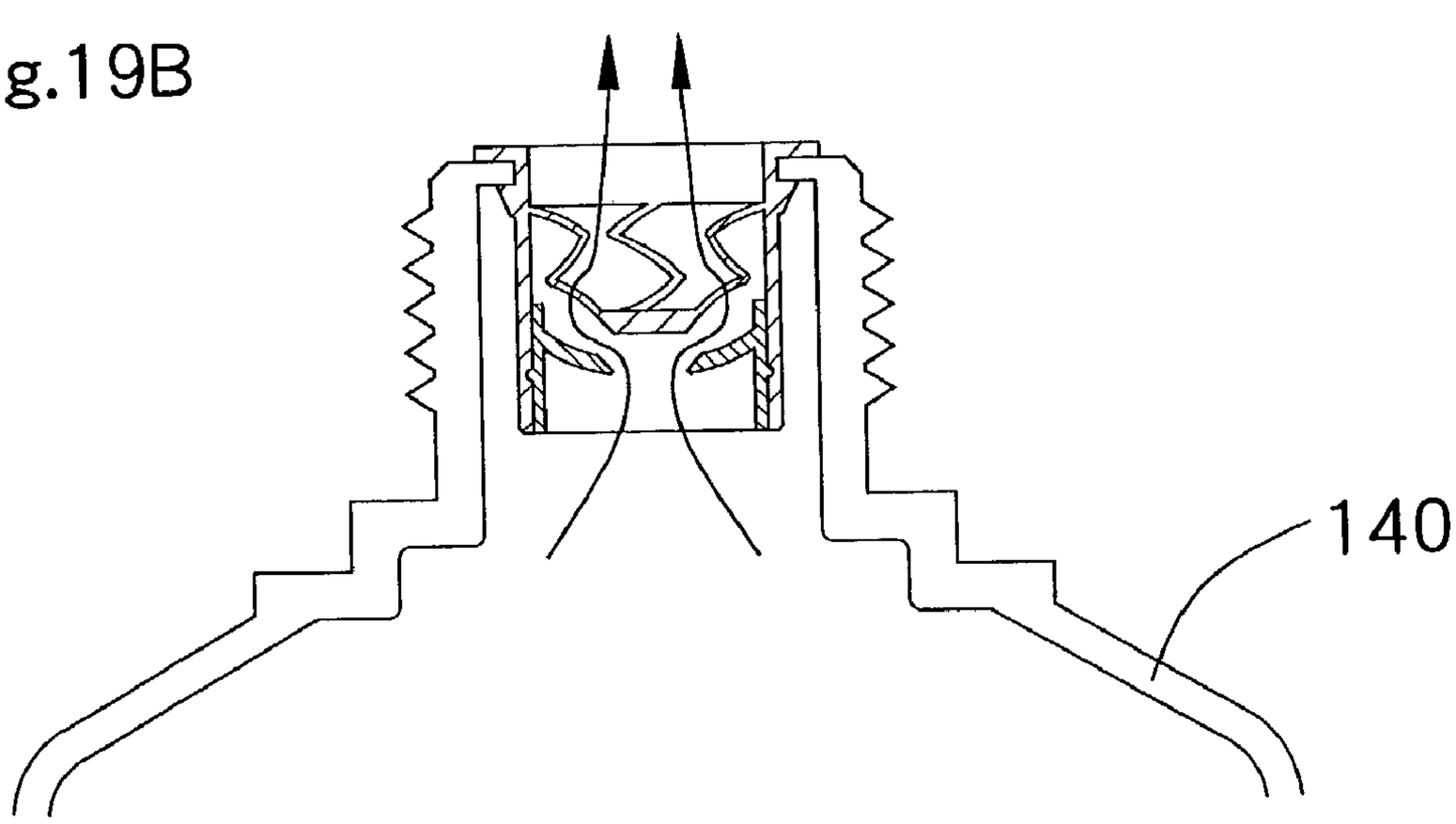

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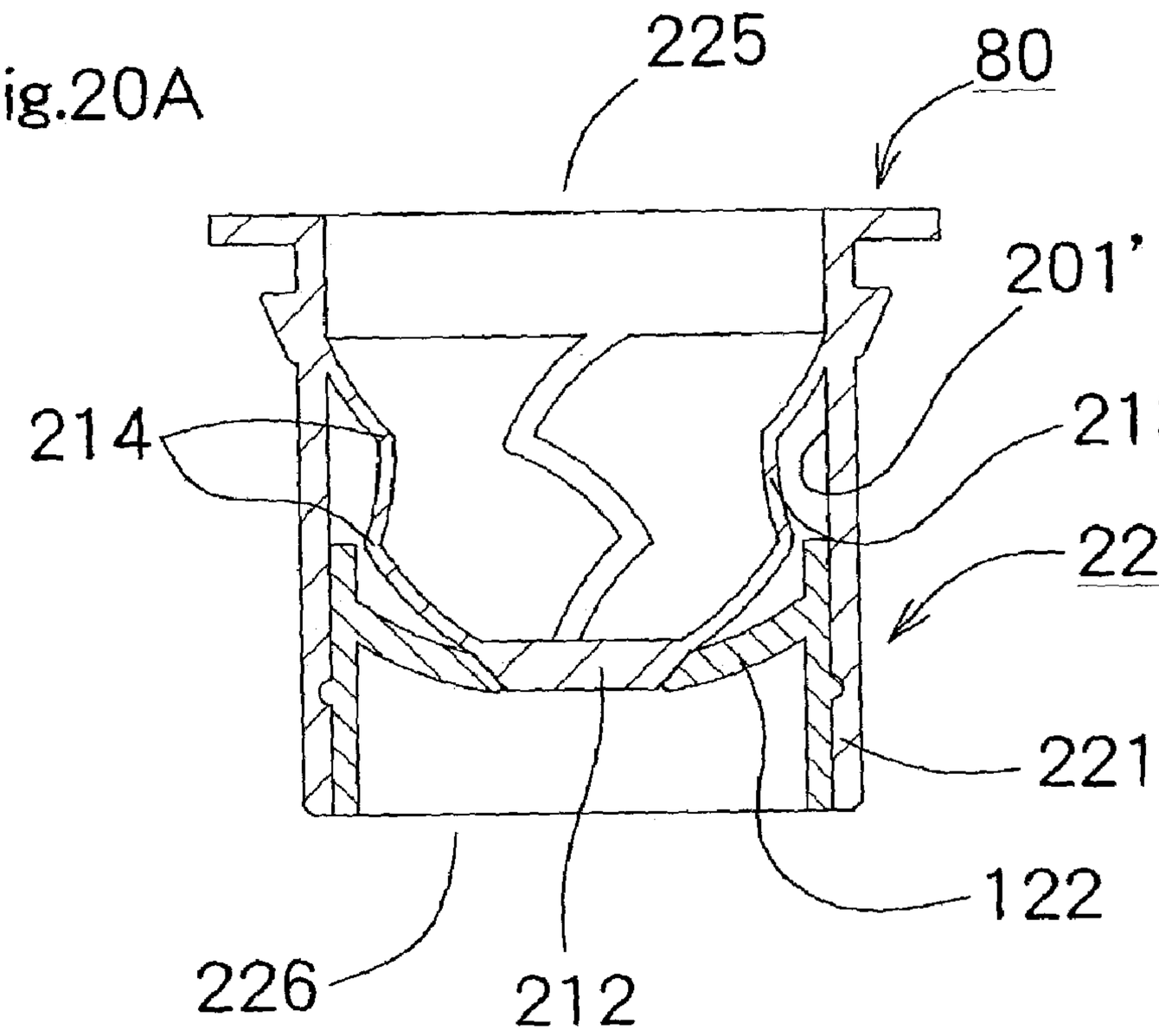

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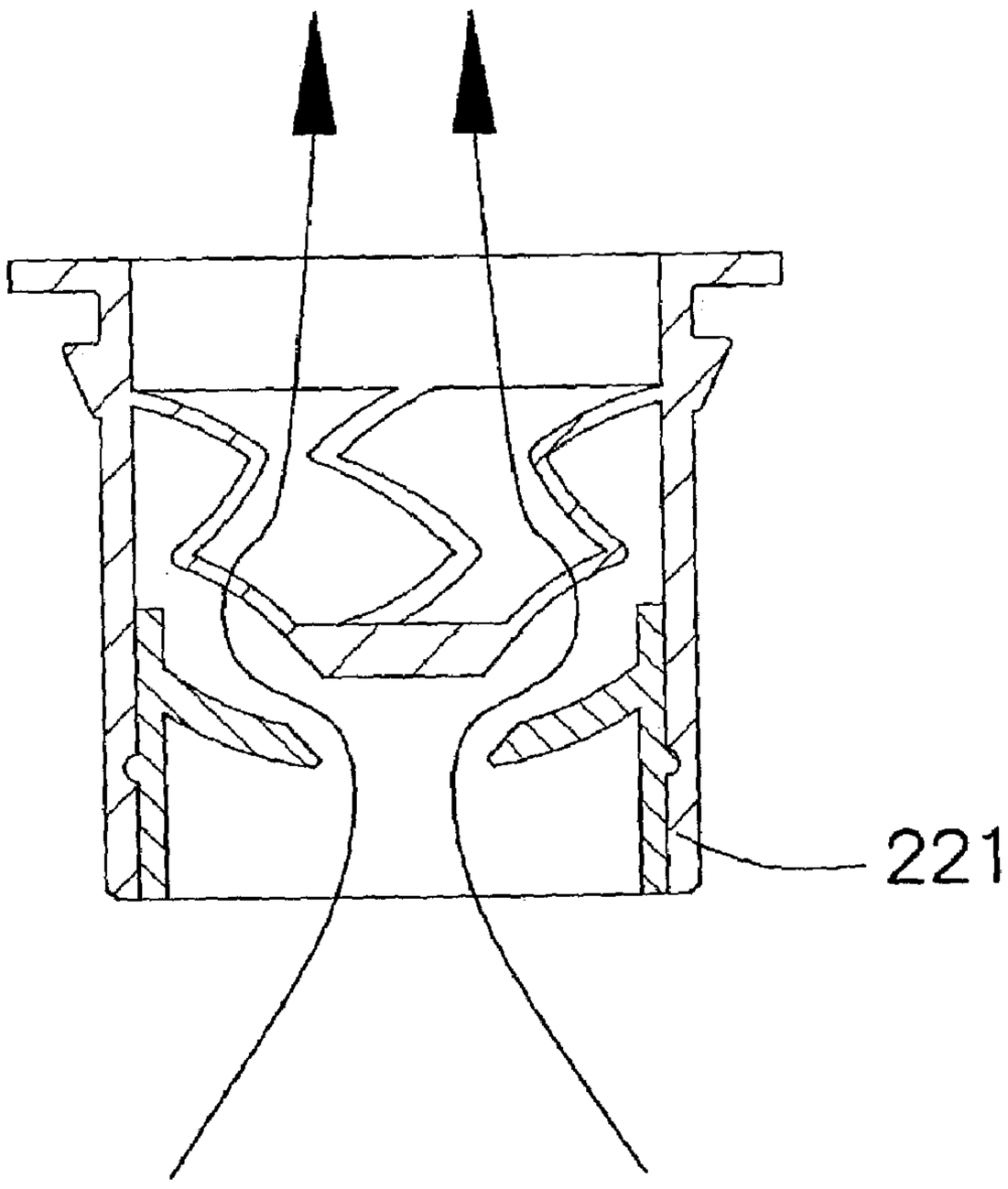

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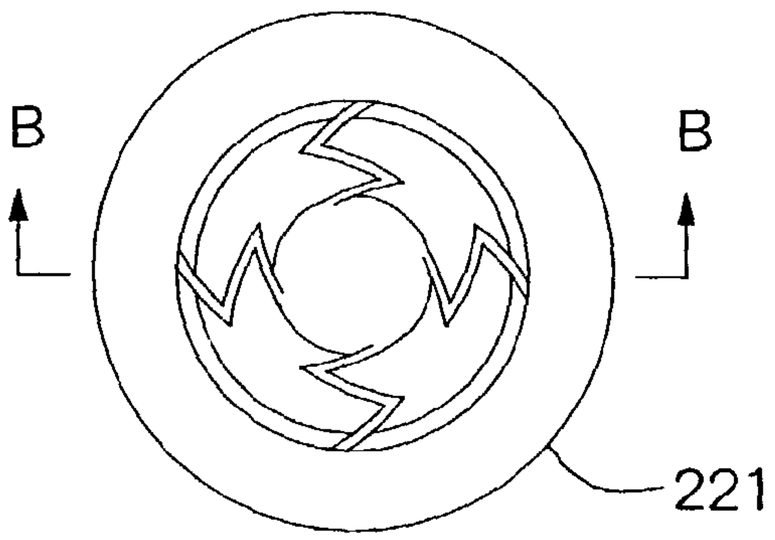

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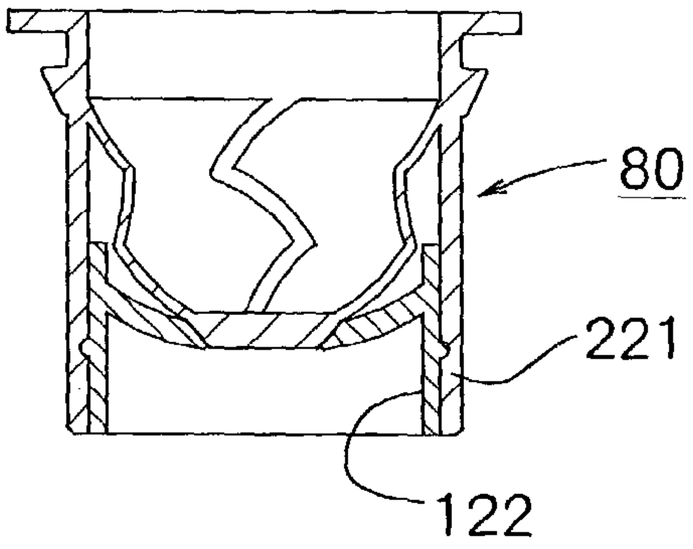

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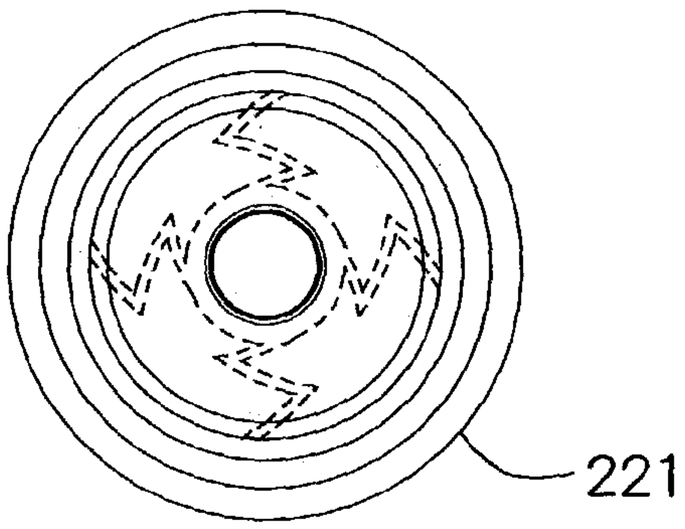

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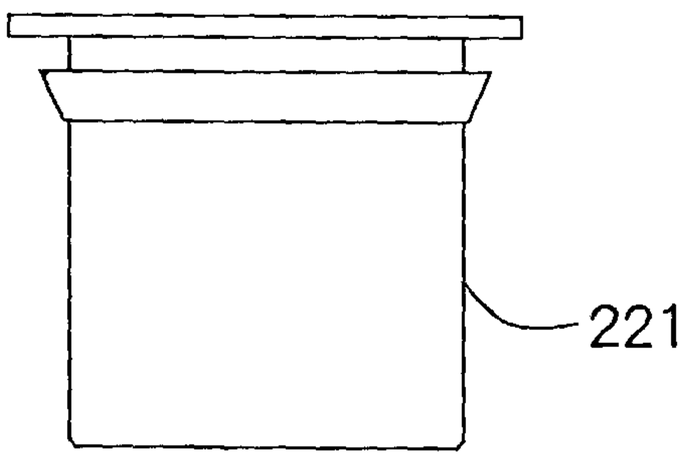

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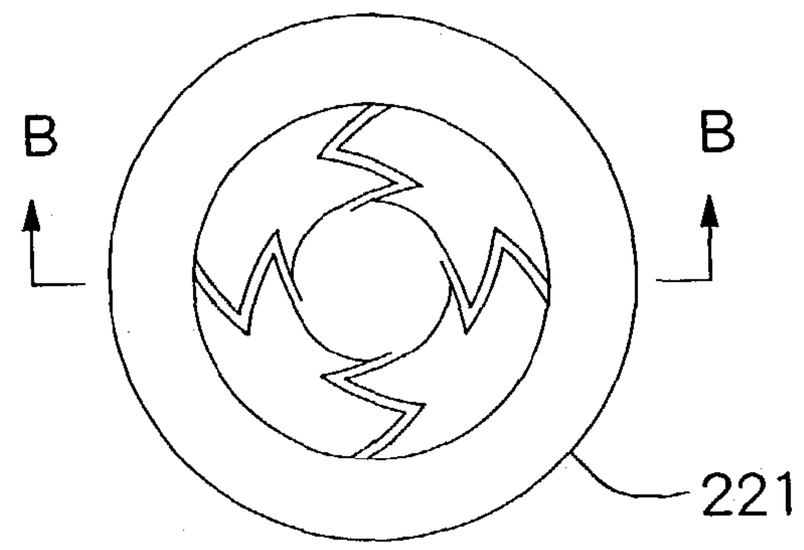

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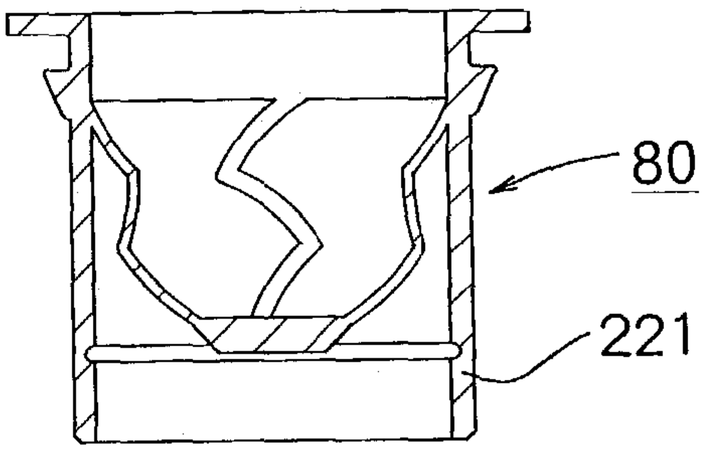

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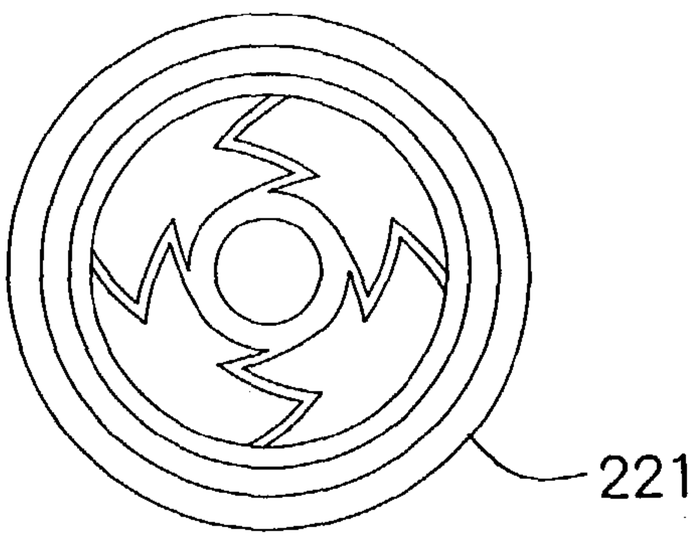

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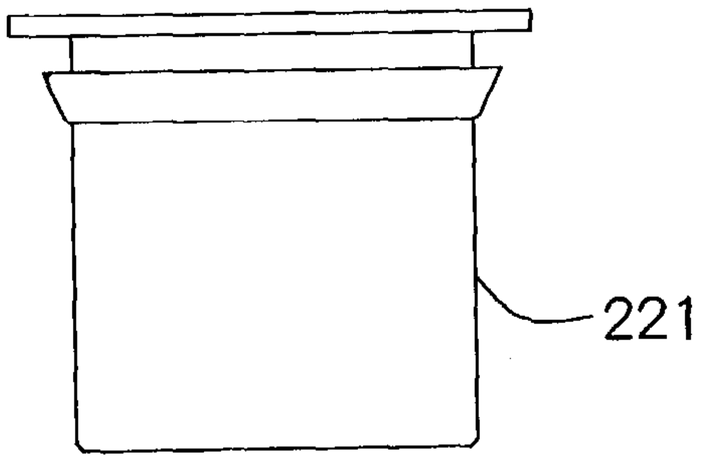

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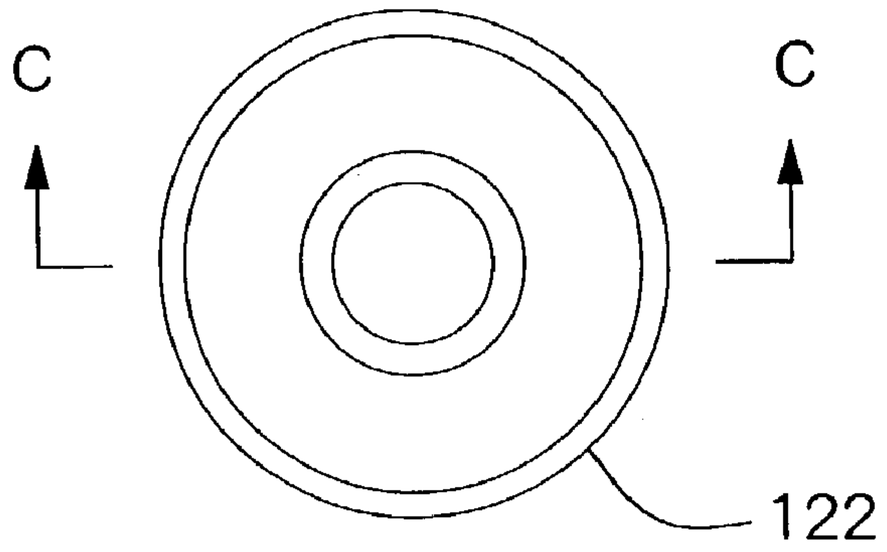


Fig.23B

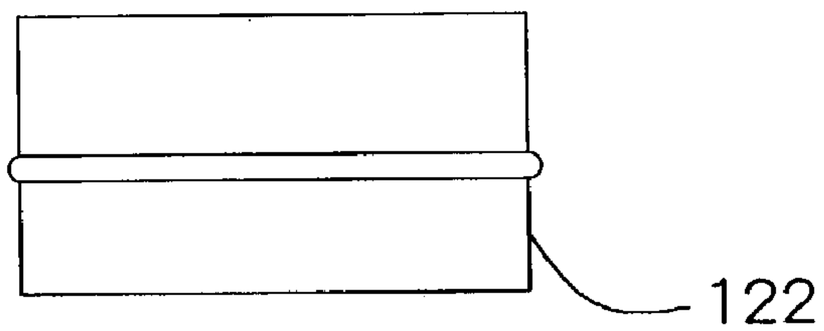


Fig.23C

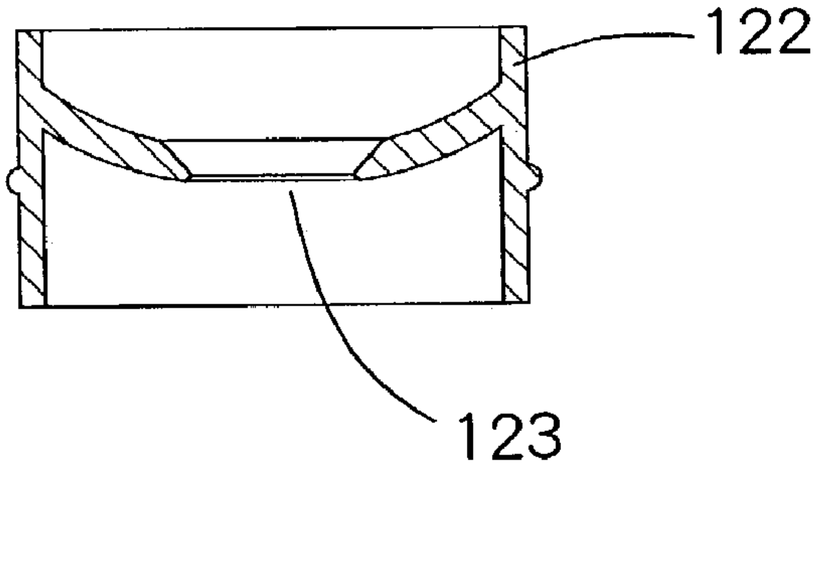
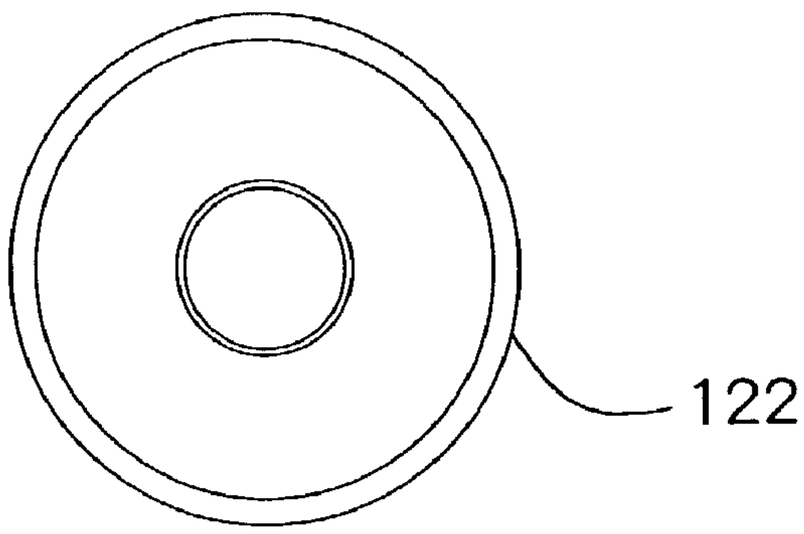


Fig.23D



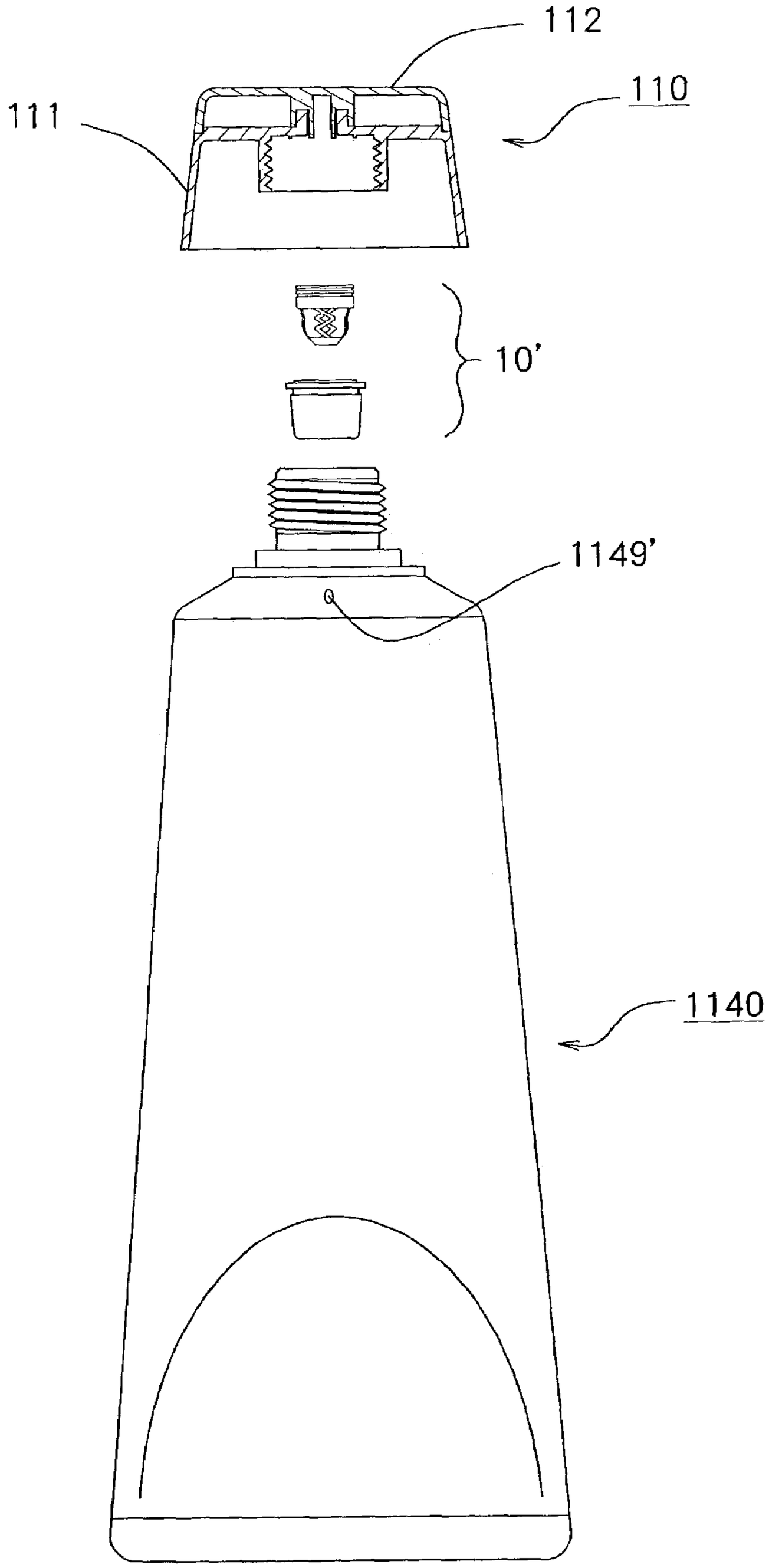


Fig.24

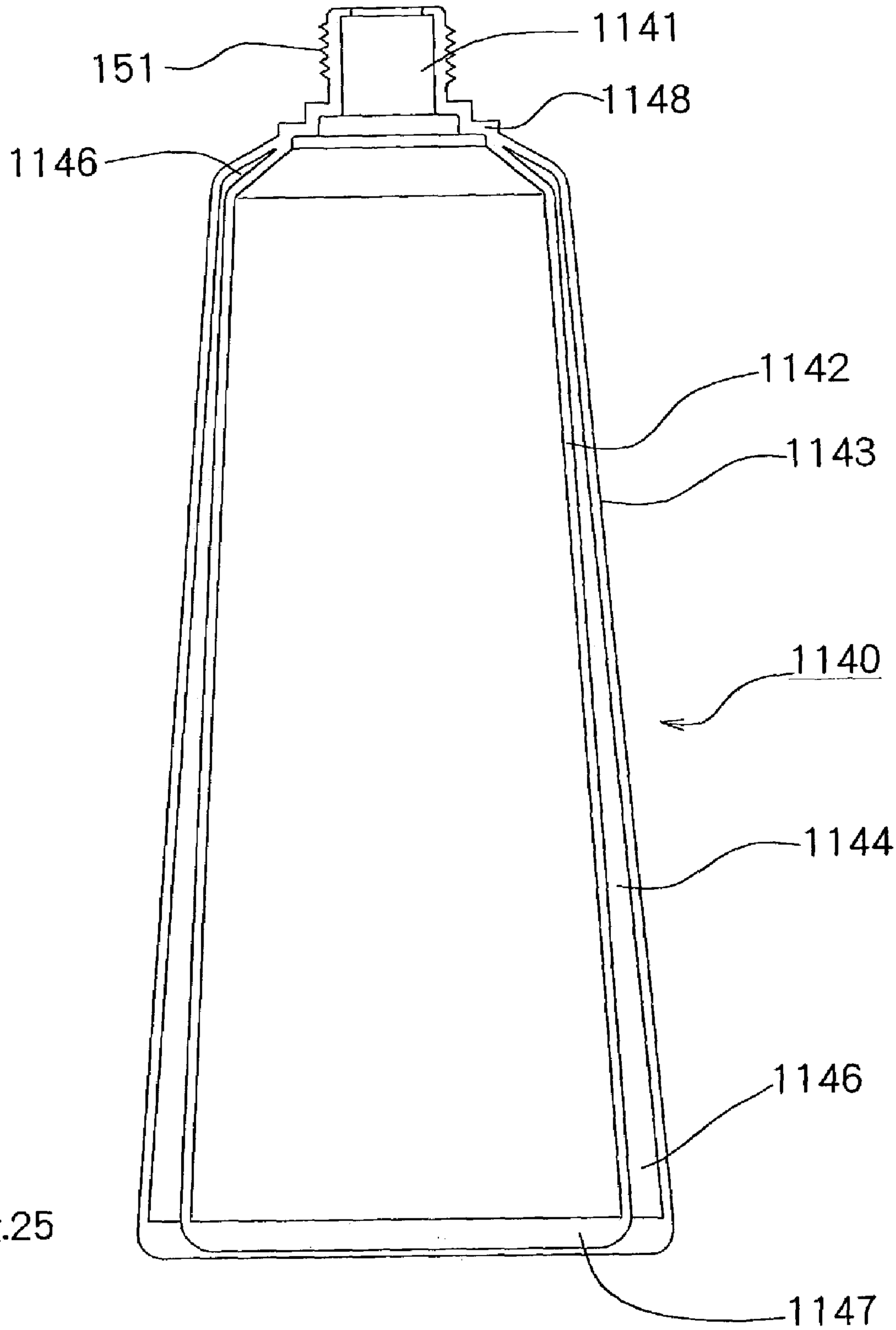


Fig.25

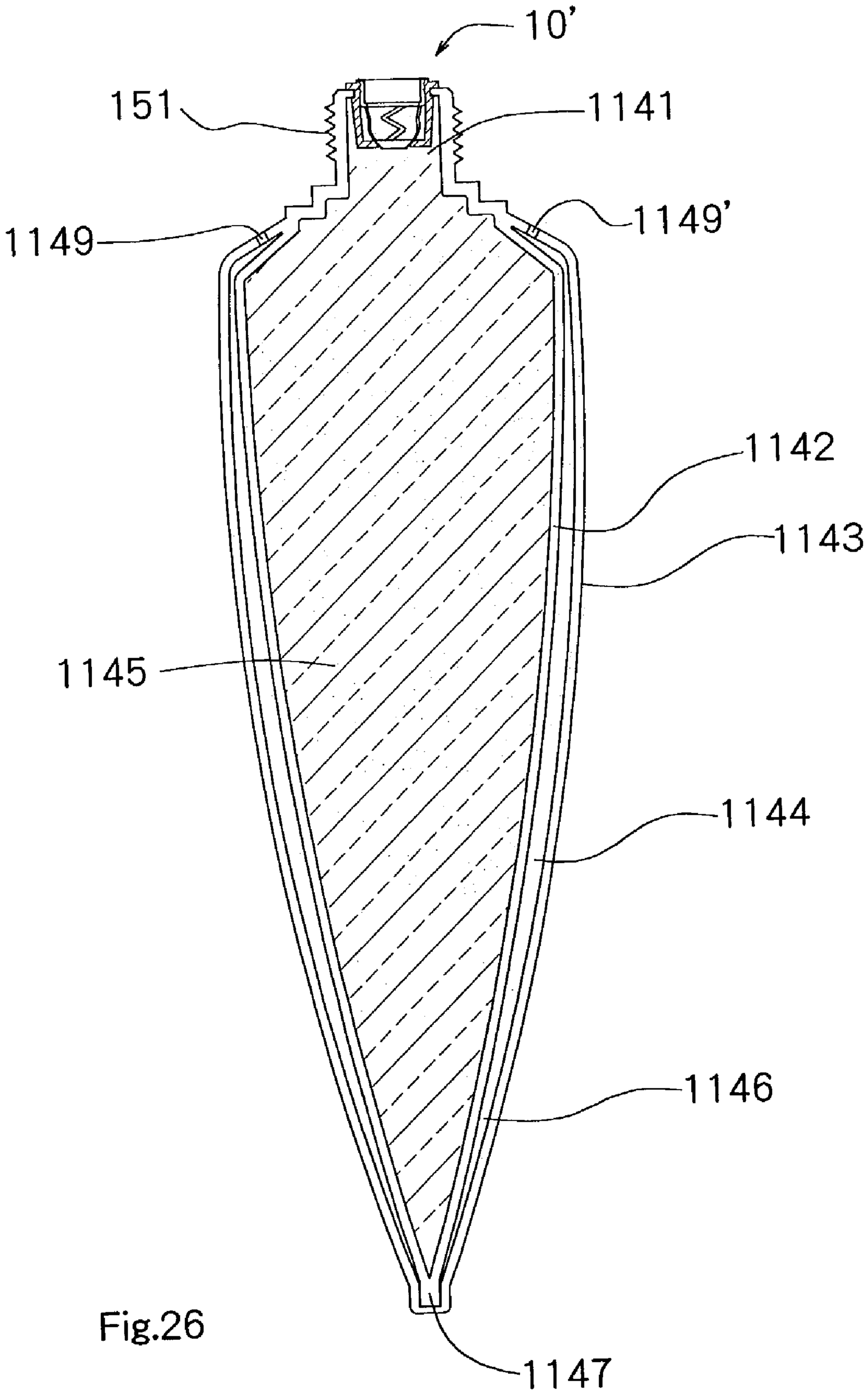


Fig.26

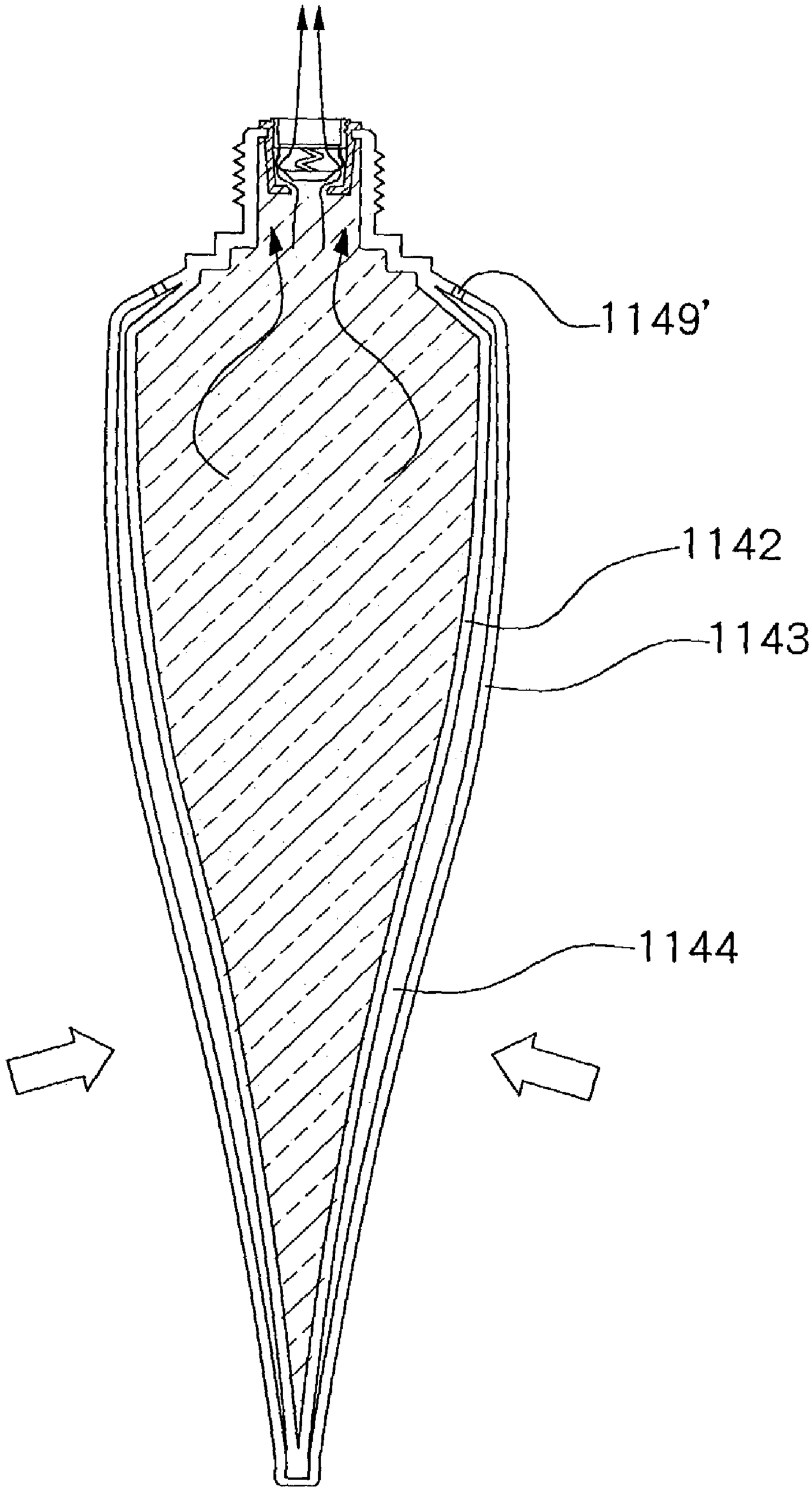


Fig.27

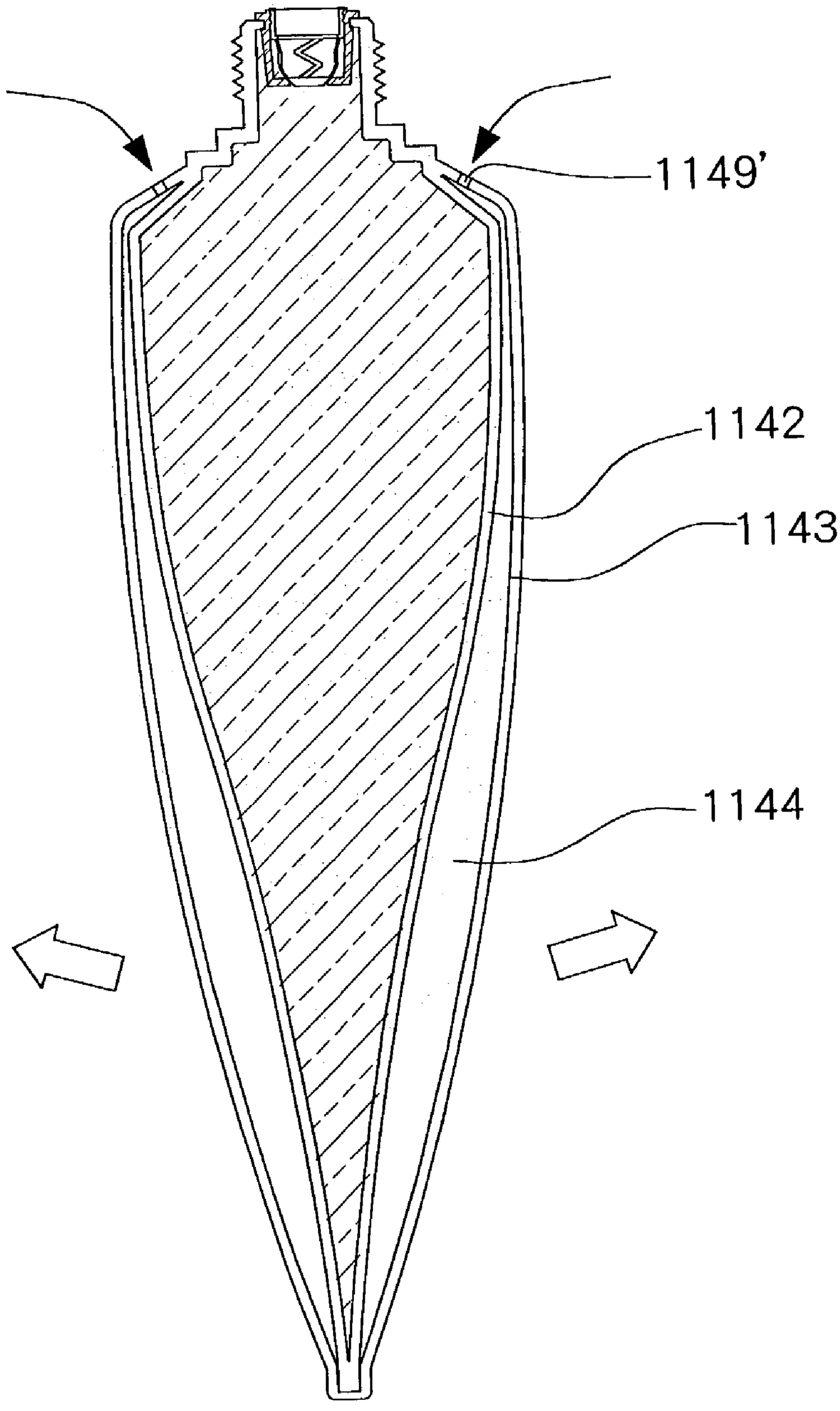


Fig.28

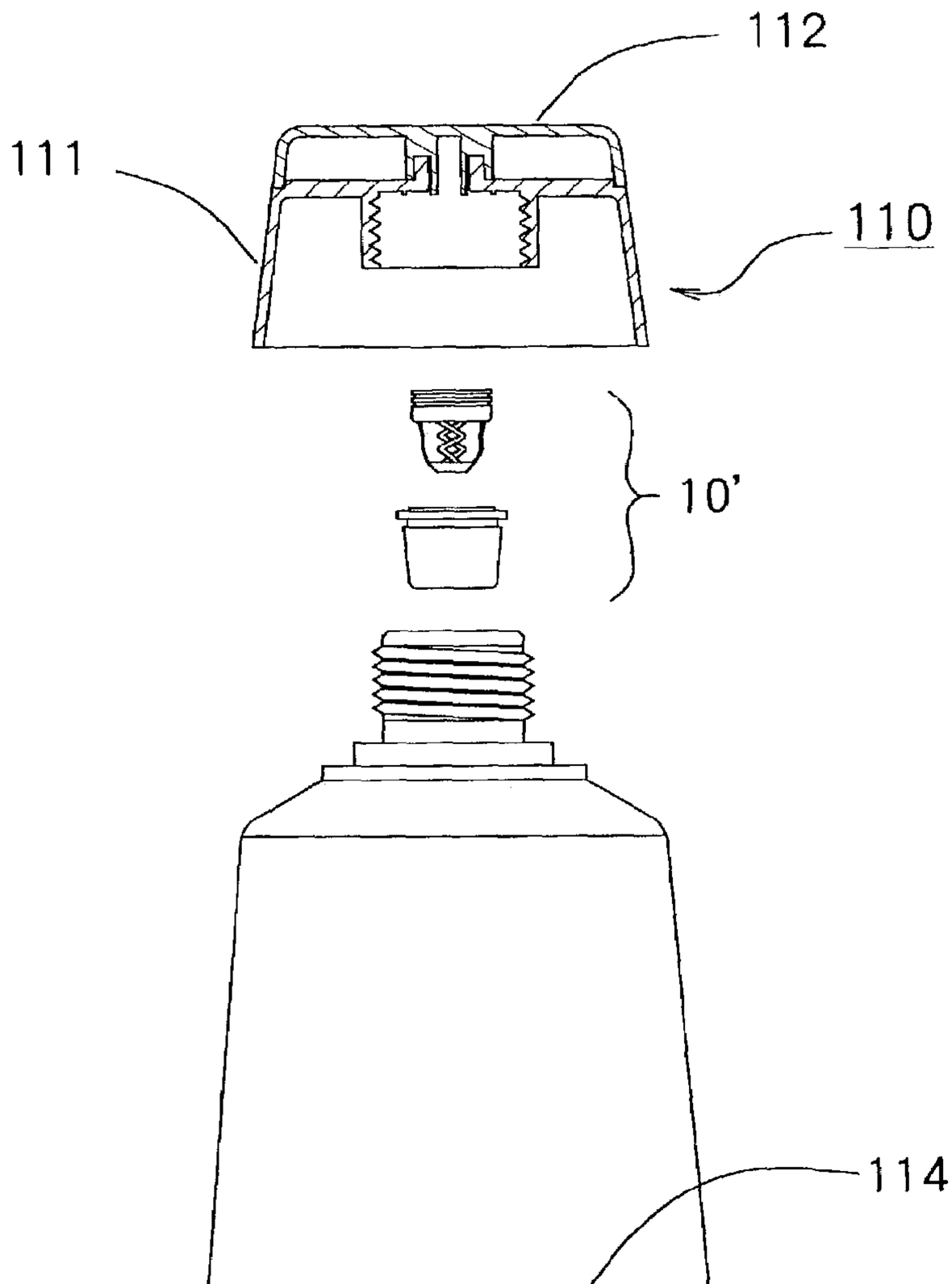


Fig.29

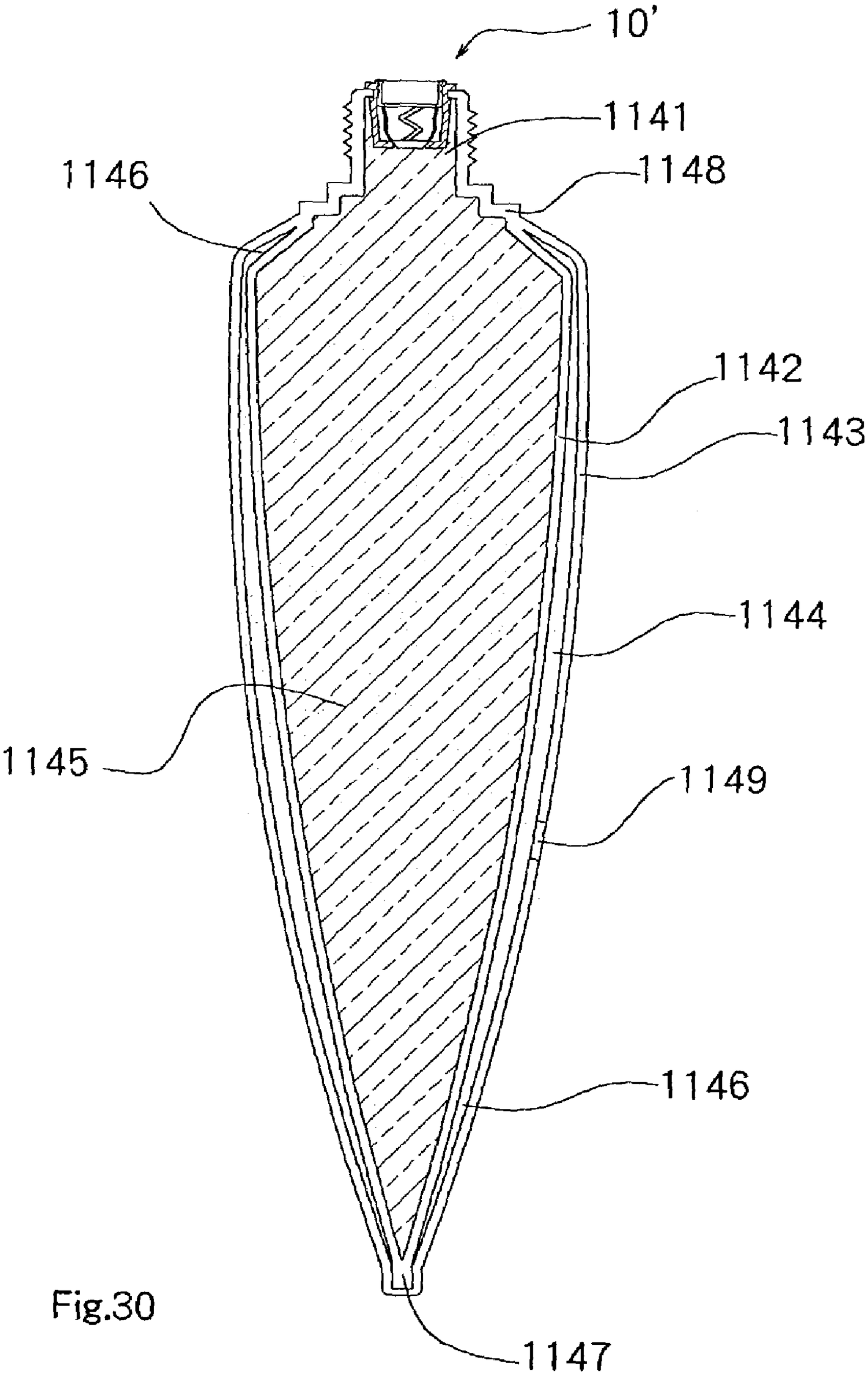


Fig.30

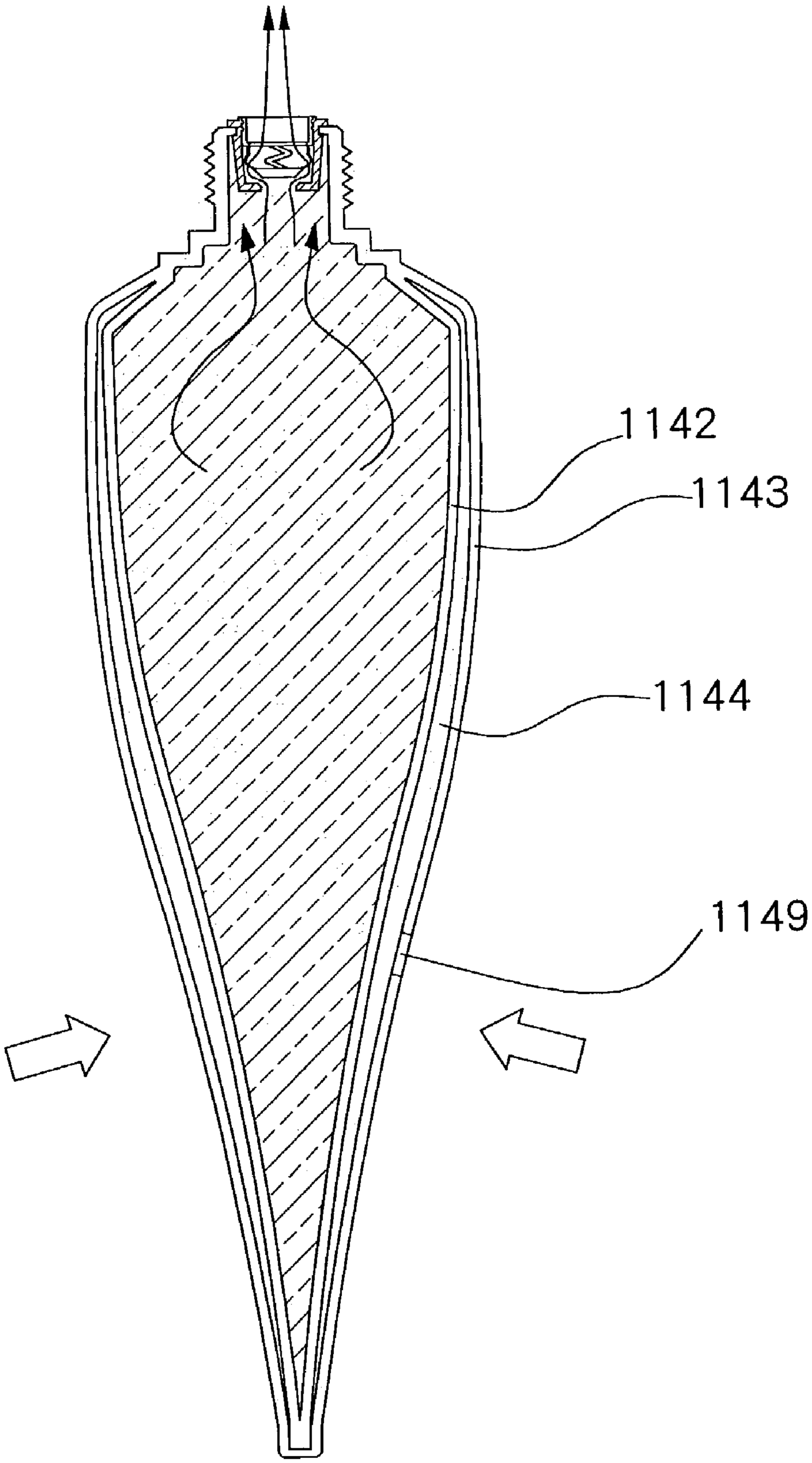


Fig.31

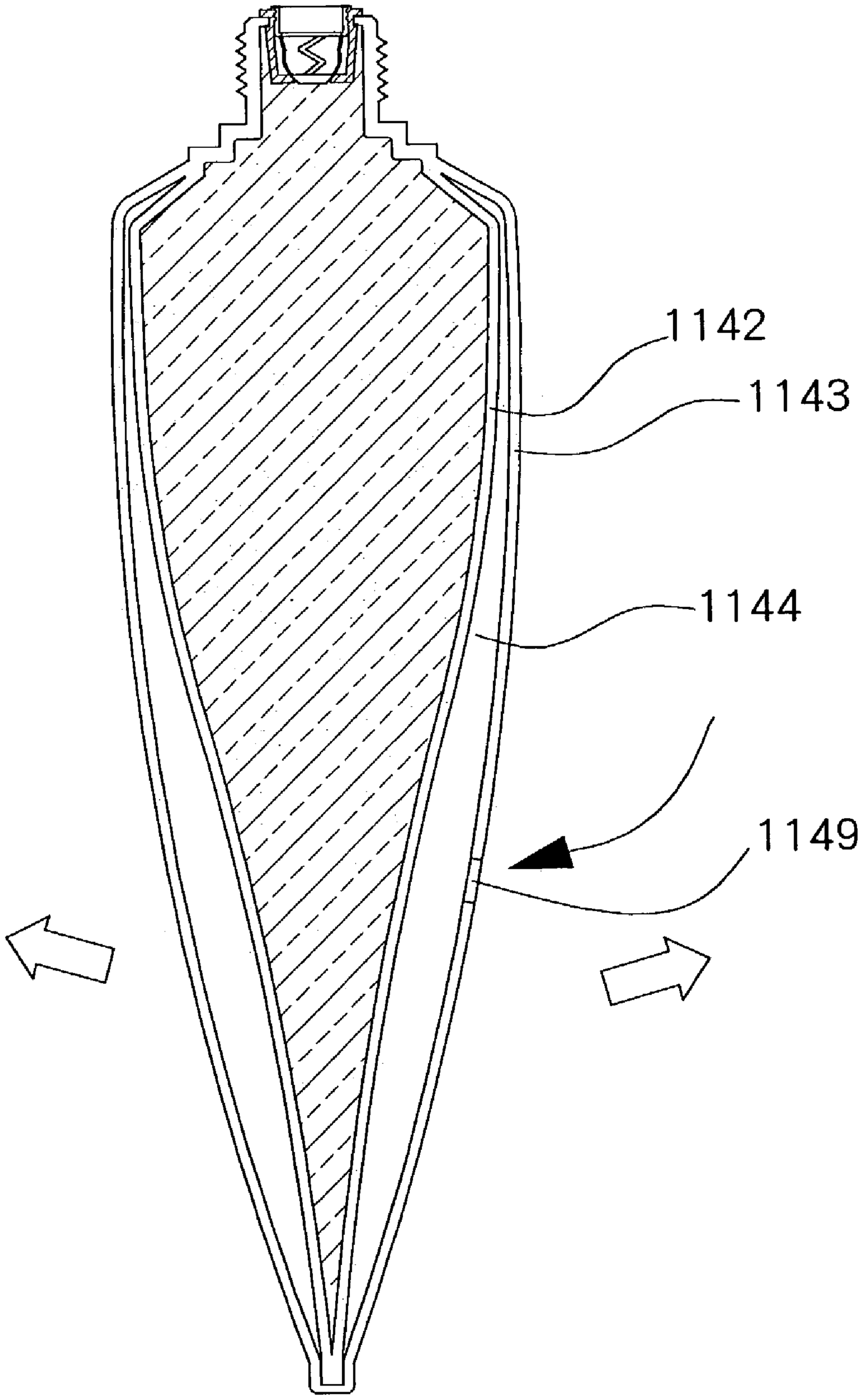


Fig.32

VALVE MECHANISM FOR TUBE-TYPE FLUID CONTAINER

BACKGROUND OF THE INVENTION

The present invention relates to a valve mechanism, particularly to a valve mechanism which can be used for a tube-type fluid container.

As this type of valve mechanism, for example, as described in Japanese Patent Laid-open No. 2001-179139, a valve mechanism having a spherical valve body and a spring for giving momentum to the valve body toward a valve seat has been used. Manufacturing costs of the valve mechanism using the spherical valve body and the spring, however, tend to be high.

Consequently, a valve mechanism having a resinous valve seat, and a resinous valve body which moves between a closed position in which the valve body contacts the valve seat and an open position in which the valve body separates from the valve seat is commonly used.

In the resinous valve mechanism, it is preferred that the valve mechanism has a simple configuration which can close a fluid flow reliably. Additionally, it is preferred that the configuration can alter a flow rate of the fluid passing through the valve mechanism discretionally according to a pressure applied to the fluid. As matters stand, however, a valve mechanism satisfying these requirements is not reported.

SUMMARY OF THE INVENTION

The present invention has been achieved to solve the above-mentioned problems. It aims to provide a valve mechanism which can close a fluid reliably while its configuration is simple and which can alter a flow rate of the fluid passing through the valve mechanism discretionally according to a pressure applied to the fluid.

The present invention includes, but is not limited to, the following embodiments. Solely for the sake of understanding some embodiments of the present invention easily, reference numerals used in the figures explained later are referred to. However, the present invention is not limited to the structures defined by these reference numerals, and any suitable combination of elements indicated by these reference numerals can be accomplished.

In an embodiment, a valve mechanism adapted for a mouth portion (or a fluid dispensing port; e.g., **141**) of a tube-type fluid container (e.g. **140**, **1140**) may comprise: (I) a valve seat portion (e.g., **20**, **220**) being cup-shaped having an opening (e.g., **23**, **26**) at its bottom through which a fluid passes, said valve seat portion having an inner wall (e.g., **201**); and (II) a resinous valve portion (e.g., **10**, **30**, **40**, **50**, **60**, **70**) comprising: (i) a valve body (e.g., **12**, **42**, **52**, **62**, **72**) having a shape corresponding to said opening; (ii) an annular support (e.g., **11**, **41**, **51**, **61**, **71**) fixedly attached to the inner wall of the valve seat portion; and (iii) multiple connectors (e.g., **13**, **43**, **53**, **63**, **73**) connecting the valve body and the support, said connectors elastically urging the valve body downward to close the opening and being outwardly bendable as the valve body moves upward, wherein when the valve body is moved upward to open the opening, the connectors move outward toward the inner wall (e.g., in a radial direction). In an embodiment, the connectors may be substantially or completely in contact with the inner wall (e.g., **101**, **301**, **401**, **501**, **601**, **701**) when moving outward and may restrict a further upward movement of the valve body.

In the above, the valve mechanism may include, but is not limited to, the following configurations:

The connectors may comprise at least three coupling portions (e.g., **13**, **43**, **53**, **63**, **73**, **79**). The coupling portions may have flections (e.g., **14**, **44**, **54**, **64**). The valve mechanism may further comprise a guide mechanism (e.g., **29**, **16**, **76**, **77**) which guides an upward and downward movement of the valve body. The guide mechanism may comprise (a) a vertical guide pin (e.g., **29**) provided in said valve body and (b) a hole portion (e.g., **16**) having a hole (e.g., **19**) wherein the guide pin is inserted, said hole portion being attached to an inner wall (e.g., **302**) of the valve seat portion. Alternatively, the guide mechanism may comprise (a) a guide plate (e.g., **77**) having an outer diameter smaller than an inner diameter of the annular support and being slidable against an inner wall (e.g., **702**) of the annular support, and (b) a rod (e.g., **76**) connecting the guide plate and the valve body. Each of the valve seat portion and the valve portion may be formed with a single integrated piece made of a resin.

In an embodiment, the valve seat portion (e.g., **220**) may be comprised of a cylindrical support (e.g., **221**) having an upper opening (e.g., **225**) and a lower opening (e.g., **226**), through which a fluid passes; and a valve seat (e.g., **122**) having an opening (e.g., **123**) at its bottom through which the fluid passes, said valve seat being fitted in inside the lower opening of the cylindrical support.

In another embodiment, a valve mechanism adapted for a mouth portion of a tube-type fluid container (e.g., **140**, **1140**) may comprise: (I) a valve seat portion (e.g., **20**, **220**) being cup-shaped having an opening (e.g., **23**) at its bottom through which a fluid passes, said valve seat portion having an inner wall (e.g., **201**); (II) a resinous valve portion (e.g., **30**, **70**) comprising: (i) a valve body (e.g., **12**, **72**) having a shape corresponding to said opening; (ii) an annular support (e.g., **11**, **71**) fixedly attached to the inner wall of the valve seat portion; and (iii) multiple connectors (e.g., **13**, **73**, **79**) connecting the valve body and the support, said connectors elastically urging the valve body downward to close the opening and being bendable as the valve body moves upward; and (RI) a guide mechanism (e.g., **29**, **16**, **76**, **77**) which guides an upward and downward movement of the valve body and restricts a sideways movement of the valve body.

In the above, the valve mechanism may include, but is not limited to, the following configurations:

The guide mechanism may not be subject to deformation (e.g., **29**, **16**, **76**, **77**). The guide mechanism may comprise (a), a vertical guide pin (e.g., **29**) provided in said valve body and (b) a hole portion (e.g., **16**) having a hole (e.g., **19**) wherein the guide pin is inserted, said hole portion being attached to an inner wall (e.g., **201**) of the valve seat portion. The guide mechanism may comprise (a) a guide plate (e.g., **77**) having an outer diameter smaller than an inner diameter of the annular support and being slidable against an inner wall (e.g., **702**, **702'**) of the annular support, and (b) a rod (e.g., **76**) connecting the guide plate and the valve body. The connectors may comprise at least three coupling portions (e.g., **13**, **73**, **79**). The coupling portions may have flections (e.g., **14**).

In an embodiment, the valve seat portion (e.g., **220**) may be comprised of a cylindrical support (e.g., **221**) having an upper opening (e.g., **225**) and a lower opening (e.g., **226**), through which a fluid passes; and a valve seat (e.g., **122**) having an opening (e.g., **123**) at its bottom through which the fluid passes, said valve seat being fitted in inside the lower opening of the cylindrical support.

In still another embodiment, a valve mechanism adapted for a mouth portion of a tube-type fluid container (e.g., **140**, **1140**) may comprise: (I) a cylindrical support (e.g., **221**) having an upper opening (e.g., **225**) and a lower opening (e.g., **226**), through which a fluid passes; (II) a valve seat portion (e.g., **122**) having an opening (e.g., **212**) at its bottom through which the fluid passes, said valve seat portion being fitted in inside the lower opening of the cylindrical support; and (III) a resinous valve portion comprising: (i) a valve body (e.g., **212**) having a shape corresponding to the opening of the valve seat; and (ii) multiple connectors (e.g., **213**) connecting the valve body to an inner wall (e.g., **201'**) of the cylindrical support, said connectors elastically urging the valve body downward to close the opening and being bendable as the valve body moves upward.

In the above, the valve mechanism may include, but is not limited to, the following configurations:

The connectors may comprise at least three coupling portions (e.g., **213**). The coupling portions may have flections (e.g., **214**). Each of the valve seat portion and the valve portion may be formed with a single integrated piece made of a resin (e.g., **80**, **122**).

Another aspect of the present invention is a tube-type fluid container comprising a container body (e.g., **140**, **1140**) for storing a fluid having a mouth portion (e.g., **141**, **1141**), and any of the foregoing valve mechanisms (any suitable combination of elements thereof) attached to the mouth portion.

In the above, the container body may be a double wall container body (e.g., **1140**) comprised of an inner container (e.g., **1142**) for storing a fluid and an outer container (e.g., **1143**), said inner container being flexible and compressible, said outer container having at least one through-hole (e.g., **1149**, **1149'**) for keeping an interior space between the inner container and the outer container at ambient pressure. The through-hole (e.g., **1149'**) may have a size which can let a small amount of air through. The through-hole (e.g., **1149**) may be formed in a portion to which a pressure is applied when the fluid is discharged. The inner container and the outer container are integrated at the mouth portion (e.g., **1148**), and welded at their bottoms (e.g., **1147**).

According to any of the foregoing valve mechanisms, a fluid can be closed reliably although its configuration is simple; a flow rate of the fluid passing through the valve mechanism can be changed discretionally according to a pressure applied to the valve mechanism. When using three or more connectors, the occurrence of an inadequate tilt in the valve body can effectively be prevented. When configuring the connectors to be substantially in contact with an inner wall of the valve seat portion, it becomes possible to more reliably prevent an inadequate tilt in the valve body from occurring. When forming flections in the connectors, the connectors have an adequate elasticity recovering force, moving the valve body satisfactorily between a closed position and an open position becomes possible. When using the guide mechanism which guides the valve body's movement from the closed position to the open position, it becomes possible to further reliably prevent an inadequate tilt in the valve body from occurring. When configuring the valve seat to be a separate piece from the cylindrical support and be fitted in the lower opening of the cylindrical support, and/or when forming the valve body, the connectors, and the cylindrical support as an integrated single piece, influence by plastic deformation caused during manufacturing processes (e.g., inflation molding) can be reduced, improving sealability between the valve body and the valve seat and improving assembly operation.

In the above, the fluid can be discharged from an outlet of the mouth portion of the container through the valve mechanism by pressing the container, wherein the connectors and the container are deformed. When releasing the pressure, both the deformed connectors and the deformed container begin restoring the shapes. The restoring force of the container causes the inner pressure to lower, thereby generating reverse flow which facilitates restoration of the connectors to close the opening of the valve seat portion, thereby effectively preventing air from coming into the container through the outlet of the mouth portion. Thus, even if the restoring force of the connectors themselves is not sufficient to close the opening of the valve seat portion, the outlet of the mouth portion can effectively be closed in combination with the restoring force of the container. Thus, even if the fluid is very viscous, the valve mechanism in combination with the container can discharge the fluid and then seal the container.

In the above, in the event that the restoring force of the container is excessive (depending on the viscosity of the fluid and the amount of the fluid remaining in the container, etc., in addition to the elasticity characteristics of the container itself), the reverse flow is strong and fast, and the connectors may not be restored so quickly that it is difficult to prevent air from coming into the container from the outlet of the mouth portion through the opening of the valve seat portion. In that case, by using a double wall container, the restoring force can be controlled so that intensity of the reverse flow can be controlled to prevent air from coming into the container.

That is, when configuring the container body to be a double wall container, despite its simple configuration, reverse flow of air from the discharge port (or the mouth) of the container into the container can be prevented and the content can be discharged easily even when an amount of the content is reduced. When forming the through-hole in the outer container in a size which can let a small amount of air through, an amount of air outflow from the inner container to the outside can be controlled to be small, enabling to apply appropriate pressure to the fluid inside the inner container because certain pressure between the inner container and the outer container can be maintained when the outer container is pressed. Wen forming the through-hole in a portion to which a pressure is applied when the fluid is discharged, an amount of air outflow from the inner container to the outside can be controlled to be small when the outer container is pressed, enabling to apply an appropriate pressure to the fluid inside the inner container. When integrating the inner container and the outer container at the mouth portion and welding them at their bottom, manufacturing a tube-type fluid container at low costs becomes possible.

Additionally, in a double wall container, restoring force of an inner container may be lower than that of a single wall container, and thus, after connectors are at a closed position, the pressure inside the inner container may remain moderately lower than the ambient pressure, so that suction force at the outlet may not be significant. In that case, it is possible to effectively prevent air from coming into the container. Further, in a double wall container, an outer container can be restored more than an inner container, and an air layer is formed between the inner container and the outer container. When restricting the flow of air released from the air layer through a through-hole or though-holes, it is possible to exert pressure on the inner container from the outer container via the air layer. Thus, even if the amount of the fluid contained in the inner container is low and thus, the inner

container is nearly flat, by pressing the outer container which has been restored to the original shape, it is possible to exert pressure onto the inner container, thereby easily discharging the fluid. Accordingly, waste of the fluid remaining inside the inner container can be minimized.

For purposes of summarizing the invention and the advantages achieved over the related art, certain objects and advantages of the invention have been described above. Of course, it is to be understood that not necessarily all such objects or advantages may be achieved in accordance with any particular embodiment of the invention. Thus, for example, those skilled in the art will recognize that the invention may be embodied or carried out in a manner that achieves or optimizes one advantage or group of advantages as taught herein without necessarily achieving other objects or advantages as may be taught or suggested herein.

Further aspects, features and advantages of this invention will become apparent from the detailed description of the preferred embodiments which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of this invention will now be described with reference to the drawings of preferred embodiments which are intended to illustrate and not to limit the invention.

FIG. **1** is a schematic diagram of a tube-type container to which a valve mechanism according to an embodiment of the present invention applies.

FIG. **2** is an enlarged view showing the relevant part of the tube-type container to which the valve mechanism according to an embodiment of the present invention applies.

FIG. **3** is an enlarged view showing the relevant part of the tube-type container to which the valve mechanism according to an embodiment of the present invention applies.

FIG. **4** is an enlarged view showing the relevant part of the tube-type container to which the valve mechanism according to an embodiment of the present invention applies.

FIG. **5**A and FIG. **5**B are schematic diagrams showing the valve portion **10** and the valve seat portion **20** comprising the valve mechanism according to Embodiment 1 of the present invention.

FIG. **6**A and FIG. **6**B are sectional views showing the motion of the valve mechanism according to Embodiment 1 of the present invention.

FIG. **7**A and FIG. **7**B are schematic diagrams showing the valve portion **30** and the valve seat portion **20** comprising the valve mechanism according to Embodiment 2 of the present invention.

FIG. **8**A and **8**B are sectional views showing the motion of the valve mechanism according to Embodiment 2 of the present invention.

FIG. **9**A and FIG. **9**B are schematic diagrams showing an example of the guide material **16**.

FIG. **10**A and FIG. **10**B are schematic diagrams showing the valve portion **40** and the valve seat portion **20** comprising the valve mechanism according to Embodiment 3 of the present invention.

FIG. **11**A and FIG. **11**B are sectional views showing the motion of the valve mechanism according to Embodiment 3 of the present invention.

FIG. **12**A and FIG. **12**B are schematic diagrams showing the valve portion **50** and the valve seat portion **20** comprising the valve mechanism according to Embodiment 4 of the present invention.

FIG. **13**A and FIG. **13**B are sectional views showing the motion of the valve mechanism according to Embodiment 4 of the present invention.

FIG. **14**A and FIG. **14**B are schematic diagrams showing the valve portion **60** and the valve seat portion **20** comprising the valve mechanism according to Embodiment 5 of the present invention.

FIG. **15**A and FIG. **15**B are sectional views showing the motion of the valve mechanism according to Embodiment 5 of the present invention.

FIG. **16**A and FIG. **16**B are schematic diagrams showing the valve portion **70** and the valve seat portion **20** comprising the valve mechanism according to Embodiment 6 of the present invention.

FIG. **17**A and FIG. **17**B are sectional views showing the motion of the valve mechanism according to Embodiment 6 of the present invention.

FIG. **18**A and FIG. **18**B are sectional views showing the motion of the valve mechanism according to Embodiment 7.

FIG. **19**A and FIG. **19**B are enlarged views showing the relevant part of the tube-type container to which the valve mechanism according to Embodiment 8 of the present invention applies.

FIG. **20**A and FIG. **20**B are sectional views showing the motion of the valve mechanism according to Embodiment 8 of the present invention.

FIG. **21**A, FIG. **21**B, FIG. **21**C, and FIG. **21**D are schematic diagrams showing the valve portion and the valve seat portion according to Embodiment 8 of the present invention. FIG. **21**A is a top view, FIG. **21**B is a cross sectional view, FIG. **21**C is a bottom view, and FIG. **21**D is a side view.

FIG. **22**A, FIG. **22**B, FIG. **22**C, and FIG. **22**D are schematic diagrams showing the cylindrical support with the valve body according to Embodiment 8 of the present invention. FIG. **22**A is a top view, FIG. **22**B is a cross sectional view, FIG. **22**C is a bottom view, and FIG. **22**D is a side view.

FIG. **23**A, FIG. **23**B, FIG. **23**C, and FIG. **23**D are schematic diagrams showing the valve seat according to Embodiment 8 of the present invention. FIG. **23**A is a top view, FIG. **23**B is a side view, FIG. **23**C is a cross sectional view, and FIG. **23**D is a bottom view.

FIG. **24** is a front view of the tube-type container according to an embodiment of the present invention.

FIG. **25** is a longitudinal section of the tube-type container without a fluid and a valve mechanism according to an embodiment of the present invention.

FIG. **26** is a lateral section showing a position before a pressure is applied to the tube-type fluid container according to Embodiment 9 of the present invention, from which the lid material **110** is omitted.

FIG. **27** is a lateral section showing a position when a pressure is applied to the tube-type fluid container according to Embodiment 9 of the present invention, from which the lid material **110** is omitted.

FIG. **28** is a lateral section showing a position when a shape of the external container **143** in the tube-type fluid container according to Embodiment 9 of the present invention is restored, from which the lid material **110** is omitted.

FIG. **29** is a front view of the tube-type fluid container according to Embodiment 10 of the present invention.

FIG. **30** is a lateral section showing the tube-type fluid container according to Embodiment 10 of the present invention, from which the lid material **110** is omitted.

FIG. **31** is a lateral section showing a position when a pressure is applied to the tube-type fluid container according to Embodiment 10 of the present invention, from which the lid material **110** is omitted.

FIG. **32** is a lateral section showing a position when a shape of the external container **143** in the tube-type fluid container according to Embodiment 10 of the present invention is restored, from which the lid material **110** is omitted.

Explanation of symbols used is as follows: **10**: Valve portion; **11**: Supporting portion; **12**: Valve body; **13**: Coupling portion; **14**: Flections; **15**: Concave portion; **16**: Guide material; **17**: Supporting portion; **18**: Coupling portion; **19**: Hole portion for guiding; **20**: Valve seat portion; **23**: Opening portion; **24**: Protruding portion; **26**: Opening portion; **29**: Guide pin; **30**: Valve portion; **40**: Valve portion; **41**: Supporting portion; **42**: Valve body; **43**: Coupling portion; **44**: Flections; **50**: Valve portion; **51**: Supporting portion; **52**: Valve body; **53**: Coupling portion; **54**: Flections; **60**: Valve portion; **61**: Supporting portion; **62**: Valve body; **63**: Coupling portion; **64**: Flection; **70**: Valve portion; **71**: Supporting portion; **72**: Valve body; **73**: Coupling portion; **76**: Coupling material; **77**: Guide plate; **110**: Lid material; **111**: Lid portion; **112**: Lid body; **113**: Opening portion; **114**: Closed portion; **115**: Female screw portion; **140**: Container main unit; **141**: Opening portion; **142**: Fluid storing portion; **143**: Flange portion; **144**: Male screw portion; **1140**: Container main unit; **1141**: Discharge port; **1142**: Internal container; **1143**: External container; **1144**: Internal space; **1145**: Internal container opening portion; **1146**: External container opening portion; **1147**: Welding portion on the bottom side; **1148**: Welding portion on the discharge port side; **1149**: Hole.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Preferred embodiments of the present invention will be described with referent to the drawings. The present invention is not limited to the embodiments. FIG. **1** is an exploded illustration showing a tube-type container to which the valve mechanism according to an embodiment of the present invention applies; FIG. **2** to FIG. **4** are enlarged views of the relevant part of the tube-type container to which the valve mechanism according to an embodiment of the present invention applies.

This tube-type container may be used as a container for any suitable fluid including beauty products for storing gels such as hair gels and cleansing gels or creams such as nourishing creams and cold creams used in the cosmetic field. This tube-type container also can be used as a container for medicines, solvents or foods, etc.

In this specification, high-viscosity liquids, semifluids, gels that sol solidifies to a jelly, and creams, and regular liquids, are all referred to as fluids. The present invention, however, is not limited to a valve mechanism used for the above-mentioned fluids and can apply to a valve mechanism used for the entire fluids including gases.

This tube-type container comprises a container main unit **140**, a lid material **110** placed at the top of the container main unit **140**, and a valve portion **10** and a valve seat portion **20** comprising a valve mechanism.

The container main unit **140** comprises a fluid storing portion **142** for storing a fluid inside it, an opening portion **141** for discharging the fluid, which is formed at one end of the fluid storing portion **142**, a flange portion **143** formed in the vicinity of the upper end of the opening portion **141**, and a male screw portion **144** formed outside the opening portion **141**. The flange portion **143** can engage with an engaging groove **21** in the valve seat portion **20**, which is described later in detail. For this purpose, the valve seat portion **20** has a configuration in which it is fixed inside the opening portion **141** in the container main unit **140** via this engaging groove **21**.

The container main unit **140** comprises synthetic resin alone or a lamination of synthetic resin and aluminum, and has an elasticity recovering force which tries to recover its original shape when a pressure applied to it is removed.

The above-mentioned lid material **110** comprises a base portion **111** at the center of which an opening portion **113** (See FIG. **3** and FIG. **4**.), a female screw portion **115** formed in the base portion **111**, and a lid body **112** at the bottom center of which a closed portion **114** is formed. The lid body **112** is constructed in such a way that it is functional like a hinge with the base portion **111**, as shown in FIG. **4**. Consequently, the lid body **112** moves between a position as shown in FIG. **2**, in which the closed position **114** closes the opening portion **113** formed at the base portion **111**, and a position as shown in FIG. **3** and FIG. **4**, in which the closed position **114** opens the opening portion **113** formed at the base portion **111**. The female screw portion **115** formed at the base portion **111** is constructed so that it screws together with the male screw portion **144** formed at the container main unit **140**.

In the a tube-type container having the above-mentioned configuration, when a fluid is discharged from the container, a pressure is applied to the fluid inside the fluid storing portion **142** by pressing the fluid storing portion **142** in the container main unit **140**. In this position, the valve mechanism comprising the valve portion **10** and the valve seat portion **20** is opened; the fluid inside the fluid storing portion **142** is discharged outward via the opening portion **113** in the lid material **110** as shown in FIG. **3**.

After a necessary amount of the fluid is discharged and when the pressure applied to the fluid storing portion **142** is removed, the fluid inside the fluid storing portion **142** is depressurized by the elasticity recovering force of the container main unit **140** and the air tries to flow back toward the fluid storing portion **142** from the opening portion **141** used for discharging the fluid.

In this tube-type container, however, by the action of the valve mechanism comprising the valve portion **10** and the valve seating portion **20**, a path in which the fluid passes through is closed. Consequently, reverse air flow can be effectively prevented.

In the above-mentioned embodiment, the lid material **110** comprising the base portion **111** at the center of which the opening portion **113** is formed and the lid body **112** at the bottom center of which the closed portion **114** is formed, is used. It is possible to use a lid material having a configuration in which the base portion **111** and the lid body **112** are integrated and the entire lid material is detached from the container main unit **140** when the fluid is discharged.

A configuration of the valve mechanism according to the present invention is described below. FIGS. **5**A and **5**B are illustrations showing the valve portion **10** and the valve seat portion **20**, which comprise the valve mechanism according to Embodiment 1 of the present invention. FIGS. **6**A and **6**B are sectional views showing the motion of the valve mechanism. Additionally, FIG. **5**A shows a plan view of the valve portion **10**; FIG. **5**B shows a view that the valve portion **10** and the valve seat portion **20** are assembled. In FIG. **5**B, a lateral view of the valve portion **10** and a sectional view of the valve seat portion **20** are shown.

As shown by these views, the valve seat portion **20** has a nearly tubular shape, at the bottom of which a circular opening portion **23** functioning as a valve seat is formed. Upward inside this valve seat portion **20**, a pair of protruding portions **24** are formed.

The valve portion **10** has a ring-shaped supporting portion **11** which is arranged inside the valve portion **20**, a valve body **12** having a shape corresponding to the circular opening portion **23** in the valve seat portion **20**, and four coupling portions **13** which couple the supporting portion **11** and the valve body **12**. The four coupling portions **13** have a pair of flections **14** respectively. In the valve portion **10**, the valve body **12** is constructed in such a way that it can move between the closed position in which the valve body **12** closes the opening portion **23** in the valve seat portion **20** and the open position in which the valve body opens the opening portion **23** by the flexibility of the four coupling portion **13**.

On an outer circumferential surface of the supporting portion **11** in the valve portion **10**, a pair of concave portions **15** is formed. Consequently, when this valve portion **10** is inserted into the valve seat portion **20**, as shown in FIGS. **6**A and **6**B, a pair of convex portions **24** in the valve seat portion **20** and a pair of concave portions in the valve portion **10** engage with each other, and the valve portion **10** is fixed inside the valve seat portion **20**. Additionally, the valve portion **10** and the valve seat portion **20** are produced by injection molding using synthetic resin such as polyethylene, etc.

In a valve mechanism having this configuration, when a pressure is applied to a fluid inside the fluid storing portion **142** by pressing the fluid storing portion **142** of the container main unit **140** shown in FIG. **1** to FIG. **4**, the valve body **12** in the valve portion **10** moves to a separated position which is separated from the opening portion **23** in the valve seat portion **20** as shown in FIG. **6**B. By this motion, the fluid passes through the opening portion **23**. When the pressure applied to the fluid storing portion **142** is removed, the valve body **12** in the valve portion **10** moves to the closed position in which the valve body closes the opening portion **23** in the valve seat portion **20** by the elasticity recovering force of the four coupling portions **13**. By this, intrusion of the air from the opening portion **23** to the fluid storing portion **142** can be prevented.

In the above, when the valve body **12** is moved upward to open the opening portion **23**, the coupling portion **13** moves outward toward an inner wall **201** (e.g., in a radial direction or in a direction of drawing an arc), and the coupling portion **13** may be substantially or completely in contact with the inner wall **201** at a point **101** when moving outward and may restrict a further upward movement of the valve body **12** (avoiding unbalanced movement) even if the fluid flow is excessive. In the figure, the coupling portion **13** appears to be in contact with the inner wall. However, the coupling portion **13** needs not be in contact with the inner and is not in contact with the inner wall when the fluid flow through the opening portion **23** is not high. The above configuration is equally applicable to FIGS. **8**B, **11**B, **13**B, **15**B, and **17**B (e.g., **301**, **401**, **501**, **601**, **701**).

In this valve mechanism, a traveling distance of the valve body **12** changes according to a pressure applied to the fluid storing portion **142**, i.e. a pressure applied to the valve mechanism, changing a flow rate of the fluid passing through the opening portion **23** discretionally becomes possible.

In this valve mechanism, the supporting portion **11** in the valve portion **10** and the valve body **12** are coupled by the four coupling portions **13**. Consequently, preventing occurrence of an inadequate tilt in the valve body **12** becomes possible. Additionally, to effectively prevent occurrence of an inadequate tilt in the valve body **12**, it is preferred to provide three or more coupling portions **13** and to arrange them equally.

In this valve mechanism, when the valve body **12** moves from the closed position to the open position, the coupling portions **13** move in the direction in which they contact the inner walls of the valve seat portion **20**. Consequently, when an inadequate tilt occurs in the valve body **12**, the coupling portions **13** contact the inner walls of the valve seat portion **20**, preventing the valve body **12** from tilting further.

Further, in this valve mechanism, the four coupling portions **13** coupling the supporting portion **11** and the valve body **12** have a pair of flections **14** respectively. Consequently, these coupling portions **13** have appropriate elasticity, enabling the valve body **12** to reciprocate smoothly between the closed position and the open position.

It is preferred that a thickness of these coupling portions **13** is 1 mm or less; a thickness within the ranger of 0.3 mm to 0.5 mm is more preferable. Additionally, a relation between a pressure applied to the fluid inside the fluid storing portion **142** and a discharge amount of the fluid can be adjusted by changing a thickness, a vertical length or a material (hardness) of the coupling portions **13**. Or, the relation between a pressure applied to the fluid inside the fluid storing portion **142** and a discharge amount of the fluid also can be adjusted by changing an elastic force by the coupling portions **13** by changing a thickness or a width of the edge portion on the supporting portion **11** side of the coupling portions **13**.

A configuration of the valve mechanism according to Embodiment 2 of the present invention is described below. FIGS. **7**A and **7**B are illustrations showing a valve portion **30** and a valve seat portion **20** comprising the valve mechanism according to Embodiment 2 of the present invention. FIGS. **8**A and **8**B are sectional views showing the motion of the valve mechanism. Additionally, FIG. **7**A shows a plan view of the valve portion **30**; FIG. **7**B shows a view that the valve portion **30** and the valve seat portion **20** are assembled. In FIGS. **7**A and **7**B, a lateral view of the valve portion **30** and a sectional view of the valve seat portion **20** are shown. Additionally, FIGS. **9**A and **9**B are illustrations showing a guide material **16**. FIG. **9**A shows its plan view; FIG. **9**B shows its lateral view.

The valve mechanism according to Embodiment 2 differs from Embodiment 1 in comprising a guide mechanism for guiding a movement of the valve body **12** from a closed position to an open position to prevent occurrence of an inadequate tilt of the valve body **12** reliably. Additionally, when the same materials are used in this embodiment as those used in Embodiment 1, the same symbols are used and detailed descriptions of the materials are omitted.

In other words, in the valve mechanism according to Embodiment 2, a guide pin **29** is set up by standing it on the top of the valve body **12** in the valve portion **30**. A guide material **16** is set up at an inner position of a supporting portion **11** in the valve portion **30**. The guide material **16** comprises a ring-shaped supporting portion **17**, three coupling portions **18** and a hole portion for guiding **19**, which encircles the guide pin **29** from its circumferential portion.

In the valve mechanism according to Embodiment 2, when the valve body **12** moves from the closed position to the open position, occurrence of an inadequate tilt of the valve body **12** is able to be prevented because the guide pin **29**, which is provided by standing it in the valve body **12**, is guided by the guiding hole portion **19** of the guiding material

16. Additionally, as in this Embodiment 2, when the guide mechanism which guides a movement of the valve body **12** from its closed position to its open position is provided, the number of the coupling portions **13** can be two.

A configuration of the valve mechanism according to Embodiment 3 is described below. FIG. **10**A and **10**B are illustrations showing a valve portion **40** and a valve seat portion **20** comprising the valve mechanism according to Embodiment 3 of the present invention. FIG. **11**A and **11**B are sectional views showing the motion of the valve mechanism. Additionally, FIG. **10**A shows a plan view of the valve portion **40**; FIG. **10**B shows a view that the valve portion **40** and the valve seat portion **20** are assembled. In FIG. **10**B, a lateral view of the valve portion **40** and a sectional view of the valve seat portion **20** are shown.

In the valve mechanism according to this Embodiment 3, bending directions of flections **44** in four coupling portions **43** differ from bending directions of the flections **14** in the coupling materials **13** in the above-mentioned Embodiments 1 and 2. Additionally, when the same materials are used in this embodiment as those used in Embodiments 1 and 2, the same symbols are used and detailed descriptions of the materials are omitted.

The valve seat portion **20** of the valve mechanism according to Embodiment 3 has a valve seat portion having a nearly tubular shape, at the bottom of which a circular opening portion **26** which functions as a valve seat is formed. Upward inside this valve seat portion **20**, a concave portion **25** is formed.

The valve portion **40** has a ring-shaped supporting portion **41** provided inside the valve seat portion **20**, a valve body **42** having a shape corresponding to the circular opening portion **26** in the valve portion **20**, and four coupling portions **43**, which couple the supporting portion **41** and the valve body **42**. The four coupling portions **43** have a pair of flections **44** respectively. In this valve portion **40**, the valve body **42** is constructed in such a way that the valve body **42** can move between a closed position in which the valve body closes the opening portion **26** in the valve seat portion **20** and an open position in which the valve body opens the opening portion **26** by the flexibility of the four coupling portions **43**.

As shown in FIGS. **11**A and **11**B, when the valve portion **40** is inserted inside the valve seat portion **20**, the concave portion **25** in the valve seat portion **20** and the supporting portion **41** in the valve portion **40** engage with each other, and the valve portion **40** is fixed inside the valve seat portion **20**. Additionally, the valve portion **40** and the valve seat portion **20** are produced by injection molding, etc. using synthetic resin such as polyethylene, etc.

In the valve mechanism having this configuration, when a pressure is applied to a fluid inside the fluid storing portion **142** by pressing the fluid storing portion **142** of the container main unit **140** shown in FIG. **1** to FIG. **4**, the valve body **42** in the valve portion **40** moves to a separated position which is separated from the opening portion **26** in the valve seat portion **20**. By this motion, the fluid passes through the opening portion **26**. When the pressure applied to the fluid storing portion **142** is removed, by the elasticity recovering force of the four coupling portions **43**, the valve body **42** in the valve portion **40** moves to the closed position in which the valve body closes the opening portion **26** in the valve seat portion **20**. By this, intrusion of the air from the opening portion **26** to the fluid storing portion **142** can be prevented.

In this valve mechanism, a traveling distance of the valve body **42** changes according to a pressure applied to the fluid storing portion **142**, i.e. a pressure applied to the valve mechanism, changing a flow rate of the fluid passing through the opening portion **26** discretionally becomes possible.

In this valve mechanism, in the same manner as in the valve mechanism according to Embodiments 1 and 2, when the valve body **42** moves from the closed position to the open position, the coupling portions **43** move in the direction in which they contact the inner walls of the valve seat portion **20**. Consequently, when an inadequate tilt occurs in the valve body **42**, the coupling portions **43** contact the inner walls of the valve seat portion **20**, preventing the valve body **42** from tilting further.

Further, in this valve mechanism, four coupling portions **43** coupling the supporting portion **41** and the valve body **42** have a pair of flections **44** respectively. Consequently, these coupling portions **43** have appropriate elasticity, enabling the valve body **42** to reciprocate smoothly between the closed position and the open position.

A configuration of the valve mechanism according to Embodiment 4 is described below. FIGS. **12**A and **12**B are illustrations showing a valve portion **50** and a valve seat portion **20** comprising the valve mechanism according to Embodiment 4 of the present invention. FIGS. **13**A and **13**B are sectional views showing the motion of the valve mechanism. Additionally, FIG. **12**A shows a plan view of the valve portion **50**; FIG. **12**B shows a view that the valve portion **50** and the valve seat portion **20** are assembled. In FIG. **12**B, a lateral view of the valve portion **50** and a sectional view of the valve seat portion **20** are shown.

While the four coupling portions **43** couple the supporting portion **41** and the valve body **42** in the above-mentioned Embodiment 3, three coupling portions **53** couple the supporting portion **51** and the valve body **52** in Embodiment 4. Additionally, when the same materials are used in this embodiment as those used in Embodiment 3, the same symbols are used and detailed descriptions of the materials are omitted.

In the valve mechanism according to this Embodiment 4, the valve portion **50** has the ring-shaped supporting portion **51** provided inside the valve seat portion **20**, the valve body **52** having a shape corresponding to the circular opening portion **26** in the valve portion **20**, and the three coupling portions **53**, which couple the supporting portion **51** and the valve body **52**. The three coupling portions **53** have a pair of flections **54** respectively. These pairs of flections **54** have different bending directions respectively. In this valve portion **50**, the valve body **52** is constructed in such a way that the valve body **52** can move between a closed position in which the valve body closes the opening portion **26** in the valve seat portion **20** and an open position in which the valve body opens the opening portion **26** by the flexibility of the three coupling portions **53**.

As shown in FIGS. **13**A and **13**B, when the valve portion **50** is inserted inside the valve seat portion **20**, the concave portion **25** in the valve seat portion **20** and the supporting portion **51** in the valve portion **50** engage with each other, and the valve portion **50** is fixed inside the valve seat portion **20**. Additionally, the valve portion **50** and the valve seat portion **20** are produced by injection molding, etc. using synthetic resin such as polyethylene, etc.

In the valve mechanism having this configuration, when a pressure is applied to a fluid inside the fluid storing portion **142** by pressing the fluid storing portion **142** of the container main unit **140** shown in FIG. **1** to FIG. **4**, the valve body **52** in the valve portion **50** moves to a separated position which is separated from the opening portion **26** in the valve seat portion **20**. By this motion, the fluid passes through the opening portion **26**. When the pressure applied to the fluid

storing portion **142** is removed, by the elasticity recovering force of the three coupling portions **53**, the valve body **52** in the valve portion **50** moves to the closed position in which the valve body closes the opening portion **26** in the valve seat portion **20**. By this, intrusion of the air from the opening portion **26** to the fluid storing portion **142** can be prevented.

In this valve mechanism, a traveling distance of the valve body **52** changes according to a pressure applied to the fluid storing portion **142**, i.e. a pressure applied to the valve mechanism, changing a flow rate of the fluid passing through the opening portion **26** discretionally becomes possible.

In this valve mechanism, in the same manner as in the valve mechanism according to Embodiments 1, 2, and 3 when the valve body **52** moves from the closed position to the open position, the coupling portions **53** move in the direction in which they contact the inner walls of the valve seat portion **20**. Consequently, when an inadequate tilt occurs in the valve body **52**, the coupling portions **53** contact the inner walls of the valve seat portion **20**, preventing the valve body **52** from tilting further.

Further, in this valve mechanism, the three coupling portions **53** coupling the supporting portion **51** and the valve body **52** have a pair of flections **54** respectively. Consequently, these coupling portions **53** have appropriate elasticity, enabling the valve body **52** to reciprocate smoothly between the closed position and the open position.

A configuration of the valve mechanism according to Embodiment 5 is described below. FIGS. **14**A and **14**B are illustrations showing a valve portion **60** and a valve seat portion **20** comprising the valve mechanism according to Embodiment 5 of the present invention. FIGS. **15**A and **15**B are sectional views showing the motion of the valve mechanism. Additionally, FIG. **14**A shows a plan view of the valve portion **60**; FIG. **14**B shows a view that the valve portion **60** and the valve seat portion **20** are assembled. In FIG. **14**, a lateral view of the valve portion **60** and a sectional view of the valve seat portion **20** are shown.

While respective coupling portions **13**, **43** and **53** in the above-mentioned Embodiments 1 to 4 have multiple flections **14**, **44** and **54**, respective coupling portions have a single flection **64** in the valve mechanism according to Embodiment 5.

In this valve mechanism, in the same manner as in the valve mechanism according to Embodiments 1 to 4, when the valve body **62** moves from a closed position to an open position, the coupling portions **63** move in the direction in which they contact the inner walls of the valve seat portion **20**. Consequently, when an inadequate tilt occurs in the valve body **62**, the coupling portions **63** contact the inner walls of the valve seat portion **20**, preventing the valve body **62** from tilting further.

Because the motion of the valve mechanism according to Embodiment 5 is the same as that of the valve mechanisms according to Embodiments 1 to 4, the detailed description for the motion is omitted.

A configuration of the valve mechanism according to Embodiment 6 is described below. FIGS. **16**A and **16**B are illustrations showing a valve portion **70** and a valve seat portion **20** comprising the valve mechanism according to Embodiment 5 of the present invention. FIGS. **17**A and **17**B are sectional views showing the motion of the valve mechanism. Additionally, FIG. **16**A shows a plan view of the valve portion **70**; FIG. **16**B shows a view that the valve portion **70** and the valve seat portion **20** are assembled. In FIG. **16**B, a lateral view of the valve portion **70** and a sectional view of the valve seat portion **20** are shown. Additionally, when the same materials are used in this embodiment as those used in Embodiments 1 and 2, the same symbols are used and detailed descriptions of the materials are omitted.

The valve portion **70** in the valve mechanism according to Embodiment 6 has a ring-shaped supporting portion **71** provided inside the valve seat portion **20**, a valve body **72** having a shape corresponding to the circular opening portion **23** in the valve portion **20**, and four coupling portions **73**, which couple the supporting portion **71** and the valve body **72**. In this valve portion **70**, the valve body **72** is constructed in such a way that the valve body **72** can move between a closed position in which the valve body closes the opening portion **23** in the valve seat portion **20** and an open position in which the valve body opens the opening portion **23** by the flexibility of the four coupling portions **73**.

As shown in FIGS. **17**A and **17**B, when the valve portion **70** is inserted inside the valve seat portion **20**, a convex portion **24** formed in the valve seat portion **20** and the concave portion **75** formed in the supporting portion **71** in the valve portion **70** engage with each other, and the valve portion **70** is fixed inside the valve seat portion **20**. Additionally, the valve portion **70** and the valve seat portion **20** are produced by injection molding, etc. using synthetic resin such as polyethylene, etc.

In the valve mechanism having this configuration, when a pressure is applied to a fluid inside the fluid storing portion **142** by pressing the fluid storing portion **142** of the container main unit **140** shown in FIG. **1** to FIG. **4**, the valve body **72** in the valve portion **70** moves to a separated position which is separated from the opening portion **23** in the valve seat portion **20**. By this motion, the fluid passes through the opening portion **23**. When the pressure applied to the fluid storing portion **142** is removed, by the elasticity recovering force of the four coupling portions **73**, the valve body **72** in the valve portion **70** moves to the closed position in which the valve body closes the opening portion **23** in the valve seat portion **20**. By this, intrusion of the air from the opening portion **23** to the fluid storing portion **142** can be prevented.

In this valve mechanism, a traveling distance of the valve body **72** changes according to a pressure applied to the fluid storing portion **142**, i.e. a pressure applied to the valve mechanism, changing a flow rate of the fluid passing through the opening portion **23** discretionally becomes possible.

In this valve mechanism, in the same manner as in the valve mechanism according to Embodiments 1 and 5, when the valve body **72** moves from the closed position to the open position, the coupling portions **73** move in the direction in which they contact the inner walls of the valve seat portion **20**. Consequently, when an inadequate tilt occurs in the valve body **72**, the coupling portions **73** contact the inner walls of the valve seat portion **20**, preventing the valve body **72** from tilting further.

In this valve mechanism, a coupling material **76** is set up by standing it above the valve body **72**; on the upper end of this coupling material **76**, a guide plate **77** is provided. An outside diameter of this guide plate **77** is slightly smaller than an inside diameter of the supporting portion **71**. Because of this, when an inadequate tilt occurs in the valve body **72**, the guide plate **77** contacts the inner walls of the valve seat portion **20**, preventing further tilting of the valve body **72**. This enables to prevent occurrence of an inadequate tilt in the valve body **72** more reliably.

When this guide mechanism comprising the coupling material **76** and the guide plate **77** is provided, it is not necessary to adopt a configuration in which the coupling portions **73** moves in the direction of contacting inner walls of the valve seat portion **20** when the valve body **72** moves from the closed position to the open position. FIGS. **18**A and

18B are sectional views showing the motion of this valve mechanism according to Embodiment 7. Additionally, when the same materials are used in this embodiment as those used in Embodiment 6, the same symbols are used and detailed descriptions of the materials are omitted.

In this valve mechanism according to Embodiment 7, as four coupling portions **79** coupling the supporting portion **71** in the valve portion **70**, a configuration, in which the coupling portions **79** move in the direction-separating from the inner walls of the valve seat portion **20** when the valve body **72** moves from the closed position to the open position, is adopted. Even when this configuration is adopted, by the action of a guide mechanism comprising the coupling material **76** and the guide plate **77**, occurrence of an inadequate tilt in the valve body **72** can be prevented.

Additionally, in respective embodiments mentioned above, the modes in which the valve mechanism according to the present invention applies to tube-type fluid containers were described. The present invention, however, also can be applied to, for example, fluid discharge pumps used for fluid storing containers, etc.

Furthermore, in respective embodiments mentioned above, the present invention is applied to the valve mechanism used for fluids. The present invention, however, can be applied to the valve mechanism used for gases. In this case, as a material for respective coupling portions **13**, **43**, **53**, **63**, **73** and **79**, a material with high rigidity is used so that stronger momentum is given to respective valve bodies **12**, **42**, **52**, **62** and **72** in the direction of the opening portions **23** and **26**.

FIG. **19**A through FIG. **23**D show Embodiment 8 of the present invention which can be applied in combination with any of the foregoing embodiments. In this embodiment, as shown ink FIGS. **20**A and **20**B and FIGS. **21**A to **21**D, a valve mechanism comprises: a cylindrical support **221** having an upper opening **225** and a lower opening **226**, through which a fluid passes; a valve seat portion **220** having an opening **123** at its bottom through which the fluid passes; and a resinous valve portion **80** comprising: (i) a valve body **212** having a shape corresponding to the opening of the valve seat **123**; and (ii) multiple connectors **213** connecting the valve body **212** to an inner wall **201'** of the cylindrical support **221**. The connectors **213** elastically urge the valve body **212** downward to close the opening **123** and is bendable as the valve body **212** moves upward. The valve seat portion **122** is fitted in inside the lower opening of the cylindrical support **221**. In the previous embodiments, the valve seat portion is a single integrated piece, and the valve body is a separate piece. However, in this embodiment, the valve seat portion **220** is comprised of different pieces (i.e., the valve seat **122** and a lower part of the cylindrical support **221**), and the valve portion **80** is a single piece including the valve body **212**, connectors **213**, and an upper part of the cylindrical support **221**. Thus, in this embodiment, the cylindrical support is both a part of the valve seat portion **220** and a part of the valve portion **80** (FIGS. **22**A–**22**D and FIGS. **23**A–**23**D).

When configuring the valve seat to be a separate piece from the cylindrical support and be fitted in the lower opening of the cylindrical support, and/or when forming the valve body, the connectors, and the cylindrical support as an integrated single piece, influence by plastic deformation caused during manufacturing processes (e.g., inflation molding) can be reduced, improving sealability between the valve body and the valve seat and improving assembly operation.

The closing and opening operation is the same as in the previous embodiments. Although this embodiment does not show connectors which are in contact with an inner wall of the cylindrical support, such connectors can be used as in the previous embodiments. Thus, the connectors may comprise at least three coupling portions, and may have flections.

Another preferred embodiment of the present invention is described with referent to the drawings. FIG. **24** is a front view of the tube-type fluid container according to Embodiment 9 of the present invention. FIG. **25** is its longitudinal section (without a valve mechanism or a fluid).

This tube-type container is used as a container for beauty products for storing gels such as hair gels and cleansing gels or creams such as nourishing creams and cold creams used in the cosmetic field. Additionally, this tube-type container also can be used as a container for medicines, solvents or foods, etc.

This tube-type container possesses a container main unit **1140**, a lid material **110** which is placed at the top of the container main unit **1140**, and a valve mechanism **10'**.

A configuration of the container main unit **1140** of the tube-type fluid container according to Embodiment 9 of the present invention is described below. FIG. **26** is a lateral section showing a position before a pressure is applied to the tube-type fluid container according to Embodiment 9 of the present invention, from which the lid material **110** is omitted. FIG. **27** is a lateral section showing a position when a pressure is applied to the tube-type fluid container according to Embodiment 9 of the present invention, from which the lid material **110** is omitted. FIG. **28** is a lateral section showing a position when a shape of the external container **1143** in the tube-type fluid container according to Embodiment 9 of the present invention is restored, from which the lid material **110** is omitted.

The container main unit **1140** possesses an internal container **1142** storing a fluid and an external container **1143** encompassing the internal container **1142**. An internal space **1144** which is shut off from the outside is formed between the internal container **1142** and the external container **1143**.

The external container **1143** in this container main unit **1140** has a configuration comprising synthetic resin alone or a lamination of synthetic resin and aluminum, and has an elasticity recovering force which tries to recover its original shape when a pressure applied to it is removed. Further, in the external container **1143**, a hole **1149'** which communicates with the interior space and the outside is formed. This hole **1149'** formed in the external container has a size (including 0.1–3 mm, 0.5–2 mm) which can let a small amount of air through. One or more holes **1149'** can be formed (including 2, 3, or 4 holes).

When a pressure is applied to the container main unit **1140** from the position shown in FIG. **26**, in which the pressure is not applied, as shown in FIG. **27**, the volume of the external container **1143** reduces as the volume of the internal container **1142** reduces by outflow of the fluid inside the internal container **1142**. At this time, by the elasticity recovering force of the external container **1143**, inside the internal space **1144** which is shut off from the outside is depressurized. Consequently, as shown in FIG. **28**, an amount of the air corresponding to the reduced volume of the external container **1143** flows into the internal space **1144** from the hole formed in the external container **1143**, which communicates with the internal space **1144** and the outside, restoring the external container **1143** to its original shape before the pressure has been applied.

Because this hole **1149'** has a size which can let a slight amount of the air through, an outflow of the air from the internal space **1144** to the outside can be controlled to be

small. Consequently, it becomes possible to apply a right pressure to the fluid inside the internal container **1142**.

The internal container **1142** and the external container **1143** are both formed/shaped by blow molding, and then an opening portion **1145** of the internal container and an opening portion **1146** of the external container are connected each other at the welding portion **1148** on the discharge port side of the container main unit **1140** and are welded at a welding portion **1147** on the bottom side. Consequently, it becomes possible to manufacture tube-type fluid containers at low costs.

The tube-type fluid container according to Embodiment 10 of the present invention is described below. FIG. **29** is a front view of the tube-type fluid container according to Embodiment 10 of the present invention. FIG. **30** is a lateral section showing the tube-type fluid container according to Embodiment 10 of the present invention, from which the lid material **110** is omitted. FIG. **31** is a lateral section showing a position when a pressure is applied to the tube-type fluid container according to Embodiment 10 of the present invention, from which the lid material **110** is omitted. FIG. **32** is a lateral section showing a position when a shape of the external container **1143** in the tube-type fluid container according to Embodiment 9 of the present invention is restored, from which the lid material **110** is omitted. Additionally, a longitudinal section of the tube-type fluid container according to Embodiment 10 of the present invention is the same as the longitudinal section of the tube-type fluid container according to Embodiment 9 of the present invention.

This tube-type fluid container, in the same way as that according to Embodiment 9, possesses an internal container **1142** storing a fluid and an external container **1143** encompassing the internal container **1142**. An internal space **1144** which is shut off from the outside is formed between the internal container **1142** and the external container **1143**; in the external container **1143**, a hole **1149** which communicates with the interior space and the outside is formed.

The hole **1149** formed in the external container **1143** at a pressing portion in the external container **1143**, to which a pressure is applied when a fluid is pushed out. With this configuration, when the external container **1143** in the container main unit **1140** is pressed, a good part of the hole **1149** is blocked off, for example, by a pressing object such as a finger; an outflow of the air to the outside from the internal space can be controlled to be small; it becomes possible to apply a right pressure to the fluid inside the internal container **1142**. The hole **1149** is larger than the hole **1149'** in the previous embodiment (e.g., a diameter of 2–10 mm, 3–5 mm). One or more holes **1149** can be formed.

Because a size of the hole **1149** should be within the range not exceeding a size of the pressing object, a large amount of the air enters the internal space when the pressing object separates from the pressing portion. By this, the external container **1143** can quickly restore its original shape.

Additionally, the valve mechanism applied to the tube-type fluid container according to the present invention is not limited to the valve mechanisms **10** according to respective embodiments described above, but can be applied to any valve mechanisms in which an opening portion is opened when the container main unit **1140** is pressed and the opening portion is closed when a pressure applied to the container main unit **1140** is removed.

Additionally, for the external container **1143**, a material with an elasticity recovering force needs to be used. For the internal container **1142**, a material without an elasticity recovering force can be used.

In the above-mentioned embodiment, a configuration in which the opening portions of the internal container **1145** and of the external container **1146** are connected each other at a welding portion **1148** on the discharge port portion side of the container main unit, and the internal container and the external container are welded at their bottoms is adopted. A different configuration, in which the container main unit **1140** comprising three parts, a discharge port material having the male screw portion **151**, the internal container **1142** and the external container **1143**, and the opening portions of the internal container **1145** and of the external container **1146** are respectively welded to the discharge port material, can also be adopted.

In the present invention, any suitable plastic material can be used including rubbers such as silicon rubbers or soft resins such as soft polyethylene. For support portions (such as the valve seat portion) to which other portions (such as the valve portion) are fitted by press-fitting, hard resins such as hard polyethylene can preferably be used. The structures can be formed by any suitable methods including injection molding.

Various embodiments of valve mechanisms have been described above. However, the present invention is not limited to particular structures depicted in the drawings. Any suitable or feasible combinations of elements can be accomplished, and the present invention includes the following: That is, the present invention can also be characterized in that a valve mechanism comprises: (i) a valve seat portion having a nearly tubular shape, at the bottom of which a circular opening portion which functions as a valve seat is formed, (ii) a ring-shaped supporting portion which is arranged inside the valve seat portion, (iii) a valve body having a shape corresponding to the circular opening portion, and (iv) multiple coupling portions which couple the supporting portion and the valve body, wherein a resinous valve portion is constructed in such a way that the valve body can move between a closed position in which the valve body closes the opening portion in the valve seat portion and an open position in which the valve body opens the opening portion by the flexibility of the multiple coupling portions.

It will be understood by those of skill in the art that numerous and various modifications can be made without departing from the spirit of the present invention. Therefore, it should be clearly understood that the forms of the present invention are illustrative only and are not intended to limit the scope of the present invention.

What is claimed is:

1. A valve mechanism adapted for a mouth portion of a tube-type fluid container, comprising:

a valve seat portion being cup-shaped having an opening at its bottom through which a fluid passes, said valve seat portion having an inner wall; and

a resinous valve portion comprising: (i) a valve body having a shape corresponding to said opening; (ii) an annular support fixedly attached to the inner wall of the valve seat portion; and (iii) multiple connectors connecting the valve body and the support, wherein said connectors has isolated flection points elastically urging the valve body downward to close the opening and are outwardly bendable as the valve body moves upward, wherein when the valve body is moved upward to open the opening, the connectors move outward toward the inner wall.

2. The valve mechanism as claimed in claim **1**, wherein the connectors comprise at least three coupling portions.

3. The valve mechanism as claimed in claim 1, wherein the isolated flection points of the connectors are in contact with the inner wall when moving outward.

4. The valve mechanism as claimed in claim 1, further comprising a guide mechanism which guides an upward and downward movement of the valve body.

5. The valve mechanism as claimed in claim 1, wherein each of the valve seat portion and the valve portion is formed with a single integrated piece made of a resin.

6. The valve mechanism as claimed in claim 1, wherein the valve seat portion is comprised of a cylindrical support having an upper opening and a lower opening, through which a fluid passes; and a valve seat having an opening at its bottom through which the fluid passes, said valve seat being fitted in inside the lower opening of the cylindrical support.

7. The valve mechanism as claimed in claim 1, wherein each of the valve seat portion and the valve portion is formed with a single integrated piece made of a resin.

8. A tube-type fluid container comprising a container body for storing a fluid having a mouth portion, and the valve mechanism of claim 1 attached to the mouth portion.

9. The container as claimed in claim 8, wherein the container body is a double wall container body comprised of an inner container for storing a fluid and an outer container, said inner container being flexible and compressible, said outer container having at least one through-hole for keeping an interior space between the inner container and the outer container at ambient pressure.

10. The container as claimed in claim 9, wherein the through-hole has a size which can let a small amount of air through.

11. The container as claimed in claim 9, wherein the through-hole is formed in a portion to which a pressure is applied when the fluid is discharged.

12. The container as claimed in claim 9, wherein the inner container and the outer container are integrated at the mouth portion, and welded at their bottoms.

13. The valve mechanism according to claim 1, wherein the connectors having the isolated flection points are N-shaped.

14. A valve mechanism adapted for a mouth portion of a tube-type fluid container, comprising:

a valve seat portion being cup-shaped having an opening at its bottom through which a fluid passes, said valve seat portion having an inner wall;

a resinous valve portion comprising: (i) a valve body having a shape corresponding to said opening; (ii) an annular support fixedly attached to the inner wall of the valve seat portion; and (iii) multiple connectors connecting the valve body and the support, said connectors elastically urging the valve body downward to close the opening and being outwardly bendable as the valve body moves upward, wherein when the valve body is moved upward to open the opening, the connectors move outward toward the inner wall; and

a guide mechanism which guides an upward and downward movement of the valve body, wherein the guide mechanism comprises (a) a vertical guide pin provided in said valve body downstream thereof and (b) a hole portion having a hole wherein the guide pin is inserted, said hole portion being attached to an inner wall of the valve seat portion.

15. The valve mechanism as claimed in claim 14, wherein the coupling portions have flections.

16. A valve mechanism adapted for a mouth portion of a tube-type fluid container, comprising:

a valve seat portion being cup-shaped having an opening at its bottom through which a fluid passes, said valve seat portion having an inner wall;

a resinous valve portion comprising: (i) a valve body having a shape corresponding to said opening; (ii) an annular support fixedly attached to the inner wall of the valve seat portion; and (iii) multiple connectors connecting the valve body and the support, said connectors elastically urging the valve body downward to close the opening and being outwardly bendable as the valve body moves upward, wherein when the valve body is moved upward to open the opening, the connectors move outward toward the inner wall; and

a guide mechanism which guides an upward and downward movement of the valve body, wherein the guide mechanism comprises (a) a guide plate having an outer diameter smaller than an inner diameter of the annular support and being slidable against an inner wall of the annular support, and (b) a rod connecting the guide plate and the valve body.

17. A valve mechanism adapted for a mouth portion of a tube-type fluid container, comprising:

a valve seat portion being cup-shaped having an opening at its bottom through which a fluid passes, said valve seat portion having an inner wall;

a resinous valve portion comprising: (i) a valve body having a shape corresponding to said opening; (ii) an annular support fixedly attached to the inner wall of the valve seat portion; and (iii) multiple connectors connecting the valve body and the support, said connectors elastically urging the valve body downward to close the opening and being bendable as the valve body moves upward; and

a guide mechanism which guides an upward and downward movement of the valve body and restricts a sideways movement of the valve body, said guide mechanism being provided downstream of the valve body, wherein said guide mechanism is not subject to deformation.

18. The valve mechanism as claimed in claim 17, wherein said connectors comprise at least three coupling portions.

19. The valve mechanism as claimed in claim 17, wherein said coupling portions have flections.

20. The valve mechanism as claimed in claim 17, wherein the valve seat portion is comprised of a cylindrical support having an upper opening and a lower opening, through which a fluid passes; and a valve seat having an opening at its bottom through which the fluid passes, said valve seat being fitted in inside the lower opening of the cylindrical support.

21. A tube-type fluid container comprising a container body for storing a fluid having a mouth portion, and the valve mechanism of claim 17 attached to the mouth portion.

22. The container as claimed in claim 21, wherein the container body is a double wall container body comprised of an inner container for storing a fluid and an outer container, said inner container being flexible and compressible, said outer container having at least one through-hole for keeping an interior space between the inner container and the outer container at ambient pressure.

23. The container as claimed in claim 22, wherein the through-hole has a size which can let a small amount of air through.

24. The container as claimed in claim 22, wherein the through-hole is formed in a portion to which a pressure is applied when the fluid is discharged.

25. The container as claimed in claim 22, wherein the inner container and the outer container are integrated at the mouth portion, and welded at their bottoms.

26. A valve mechanism adapted for a mouth portion of a tube-type fluid container, comprising:

a valve seat portion being cup-shaped having an opening at its bottom through which a fluid passes, said valve seat portion having an inner wall;

a resinous valve portion comprising: (i) a valve body having a shape corresponding to said opening; (ii) an annular support fixedly attached to the inner wall of the valve seat portion; and (iii) multiple connectors connecting the valve body and the support, said connectors elastically urging the valve body downward to close the opening and being bendable as the valve body moves upward; and

a guide mechanism which guides an upward and downward movement of the valve body and restricts a sideways movement of the valve body, said guide mechanism being provided downstream of the valve body, wherein said guide mechanism comprises (a) a vertical guide pin provided in said valve body and (b) a hole portion having a hole wherein the guide pin is inserted, said hole portion being attached to an inner wall of the valve seat portion.

27. A valve mechanism adapted for a mouth portion of a tube-type fluid container, comprising:

a valve seat portion being cup-shaped having an opening at its bottom through which a fluid passes, said valve seat portion having an inner wall;

a resinous valve portion comprising: (i) a valve body having a shape corresponding to said opening; (ii) an annular support fixedly attached to the inner wall of the valve seat portion; and (iii) multiple connectors connecting the valve body and the support, said connectors elastically urging the valve body downward to close the opening and being bendable as the valve body moves upward; and

a guide mechanism which guides an upward and downward movement of the valve body and restricts a sideways movement of the valve body, wherein said guide mechanism comprises (a) a guide plate having an outer diameter smaller than an inner diameter of the annular support and being slidable against an inner wall of the annular support, and (b) a rod connecting the guide plate and the valve body.

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